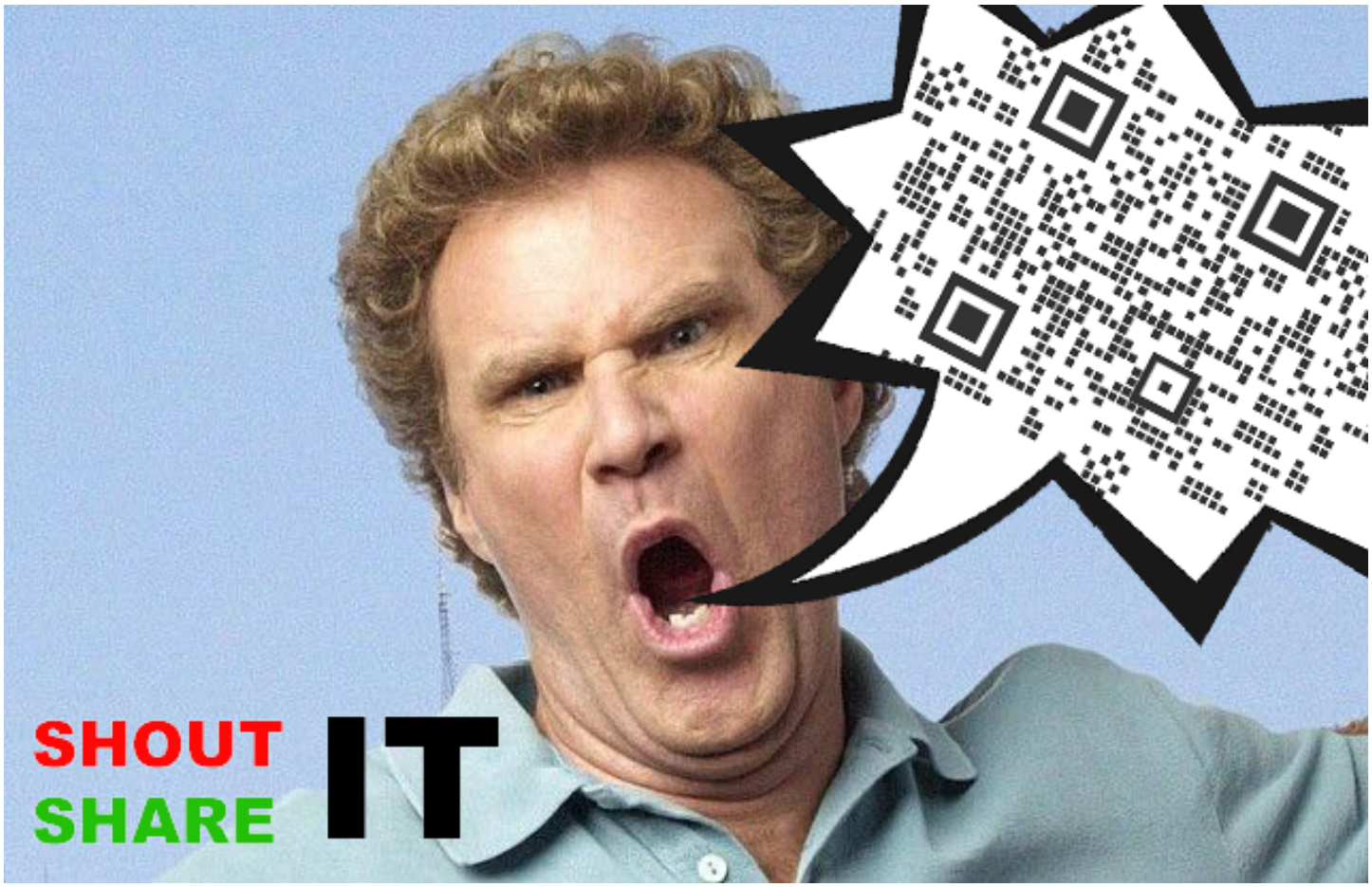
Sensation and Perception

Chapter 3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Chapter 3 Learning Objective Menu

- LO 3.1 Sensation and how it enters central nervous system
- LO 3.2 How some sensations are ignored
- LO 3.3 Light
- LO 3.4 How parts of the eye work together
- LO 3.5 How eyes see and how eyes see color
- LO 3.6 Sound
- LO 3.7 How parts of ear work together to hear sounds
- LO 3.8 Hearing impairment
- LO 3.9 How to help people with hearing impairment
- LO 3.10 How senses of taste and smell work
- LO 3.11 Sense of touch and experiencing pain
- LO 3.12 How body knows it is moving and balanced
- LO 3.13 Perception and perceptual constancies
- LO 3.14 Gestalt principles of perception
- LO 3.15 How the world is perceived in three dimensions
- LO 3.16 How visual illusions work
- LO 3.17 Factors that influence perception

Sensation

- Sensation - the activation of receptors in the various sense organs.
- Sensory receptors - specialized forms of neurons.
- Sense organs:
  - eyes
  - ears
  - nose
  - skin
  - taste buds

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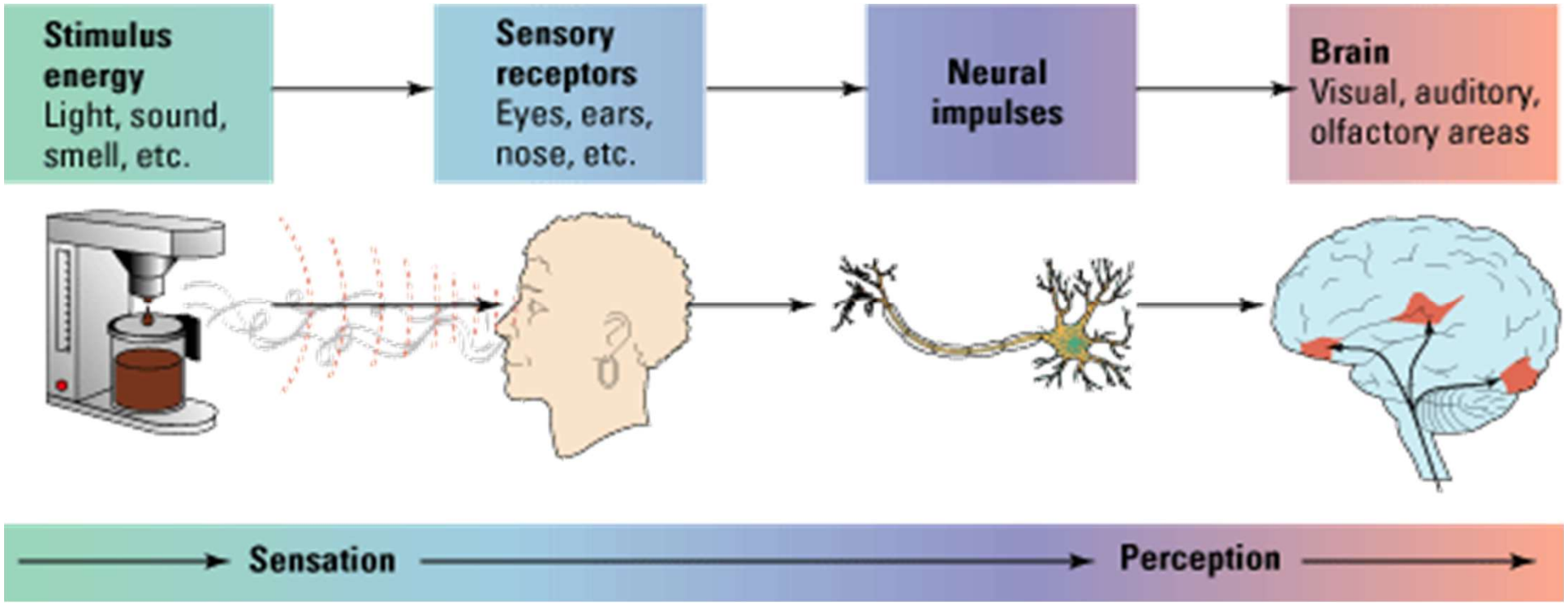
LO 3.1 Sensation and the central nervous system



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Sensory Thresholds

- Just noticeable difference (jnd or the difference threshold) - the smallest difference between two stimuli that is detectable 50 percent of the time.
- Absolute threshold - the smallest amount of energy needed for a person to consciously detect a stimulus 50 percent of the time it is present.

TABLE 3.1 EXAMPLES OF ABSOLUTE THRESHOLDS

Sense	Threshold
Sight	A candle flame at 30 miles on a clear, dark night
Hearing	The tick of a watch 20 feet away in a quiet room
Smell	One drop of perfume diffused throughout a three-room apartment
Taste	1 teaspoon of sugar in 2 gallons of water
Touch	A bee's wing falling on the cheek from 1 centimeter above

Menu

Subliminal Sensation

- Subliminal stimuli - stimuli that are below the level of conscious awareness.
  - Just strong enough to activate the sensory receptors but not strong enough for people to be consciously aware of them.
  - Limin - “threshold”
  - Sublimin - “below the threshold.”
- Subliminal perception – process by why subliminal stimuli act upon the unconscious mind, influencing behavior.

Menu

LO 3.2 How sensations can be ignored

Habituation and Sensory Adaptation

- Habituation - tendency of the brain to stop attending to constant, unchanging information.
- Sensory adaptation - tendency of sensory receptor cells to become less responsive to a stimulus that is unchanging.
- Saccades - constant movement of the eyes, tiny little vibrations called that people do not notice consciously; prevents sensory adaptation to visual stimuli.

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Psychological Aspects to Light

- Brightness - determined by the amplitude of the wave—how high or how low the wave actually is. The higher the wave, the brighter the light will be. Low waves are dimmer.
- Color - or hue, is determined by the length of the wave.
  - Long wavelengths are found at the red end of the visible spectrum (the portion of the whole spectrum of light that is visible to the human eye), whereas shorter wavelengths are found at the blue end.
- Saturation - refers to the purity of the color people see; mixing in black or gray would also lessen the saturation.

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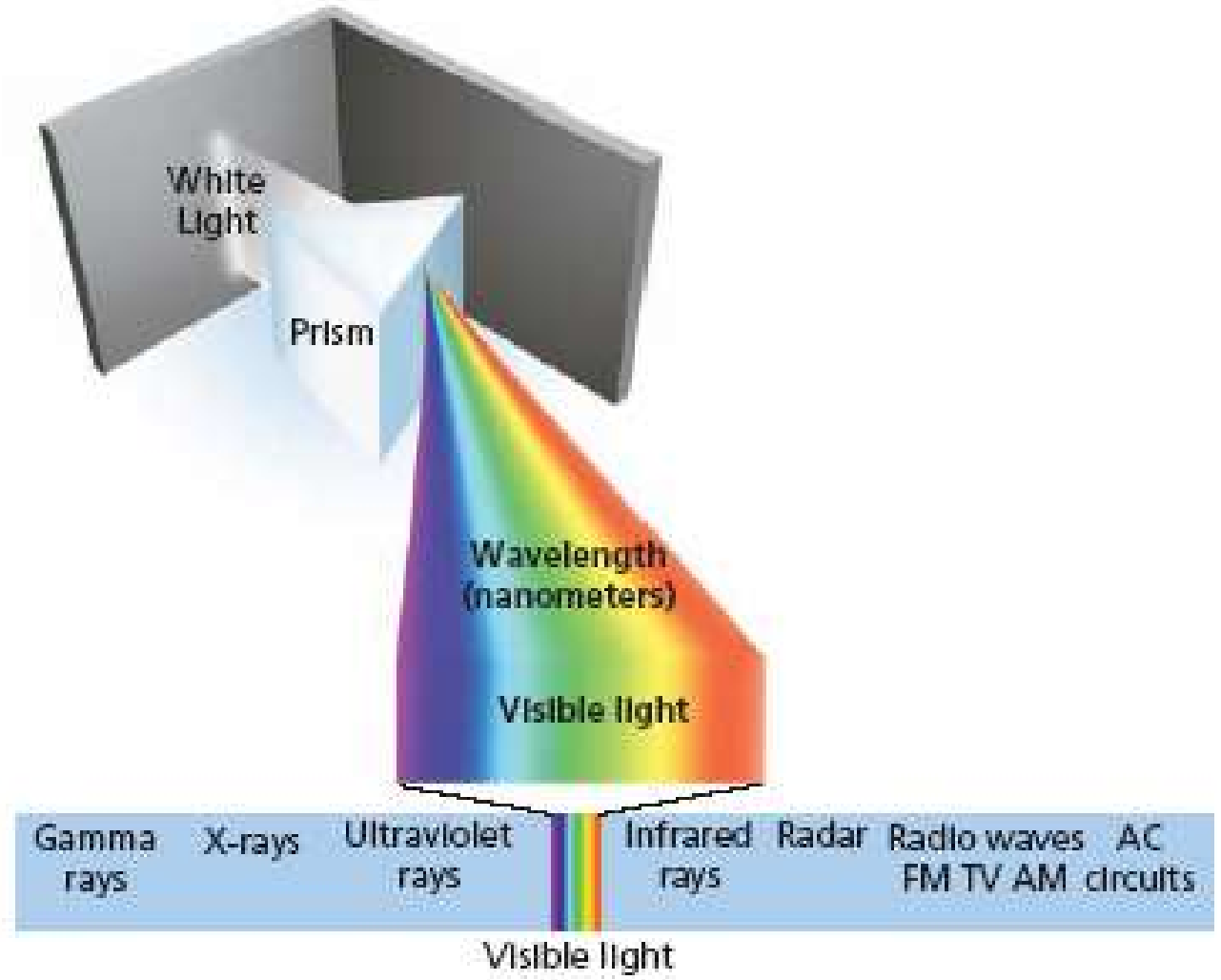
LO 3.3 Light

FIGURE 3.1 **The Visible Spectrum**
The wavelengths that people can see are only a small part of the whole electromagnetic spectrum.



Menu

Structure of the Eye

- Cornea – clear membrane that covers the surface of the eye; protects the eye and is the structure that focuses most of the light coming into the eye.
- Radial kerototomy - vision-improving technique that uses this fact by making small incisions in the cornea to change the focus in the eye.
- Aqueous humor - next visual layer; clear, watery fluid that is continually replenished and supplies nourishment to the eye.
- Pupil – hole through which light from the visual image enters the interior of the eye.

Menu

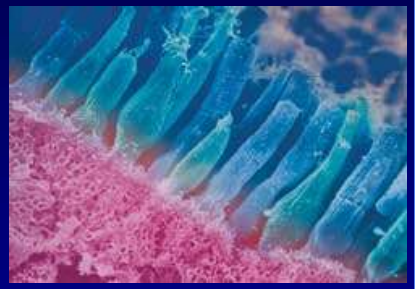
Structure of the Eye

- Iris - round muscle (the colored part of the eye) in which the pupil is located; can change the size of the pupil, letting more or less light into the eye; helps focus the image.
- Lens – another clear structure behind the iris, suspended by muscles; finishes the focusing process begun by the cornea.
- Visual accommodation - the change in the thickness of the lens as the eye focuses on objects that are far away or close.
- Vitreous humor - jelly-like fluid called that also nourishes the eye and gives it shape.

Menu

Retina, Rods, and Cones

- Retina – final stop for light in the eye. Contains 3 layers:
  - Ganglion cells
  - Bipolar cells
  - Photoreceptors that respond to various light waves
    - Rods - visual sensory receptors found at the back of the retina, responsible for noncolor sensitivity to low levels of light.
    - Cones - visual sensory receptors found at the back of the retina, responsible for color vision and sharpness of vision.



Menu

Retina, Rods, and Cones

- Blind spot - area in the retina where the axons of the three layers of retinal cells exit the eye to form the optic nerve, insensitive to light.

FIGURE 3.4 The Parts of the Retina

about twenty to one. (b) The blind spot demonstration. Hold the book in front of you. Close your right eye and stare at the picture of the dog with your left eye. Slowly bring the book closer to your face. The picture of the cat will disappear at some point, because the light from the picture of the cat is falling on your blind spot.

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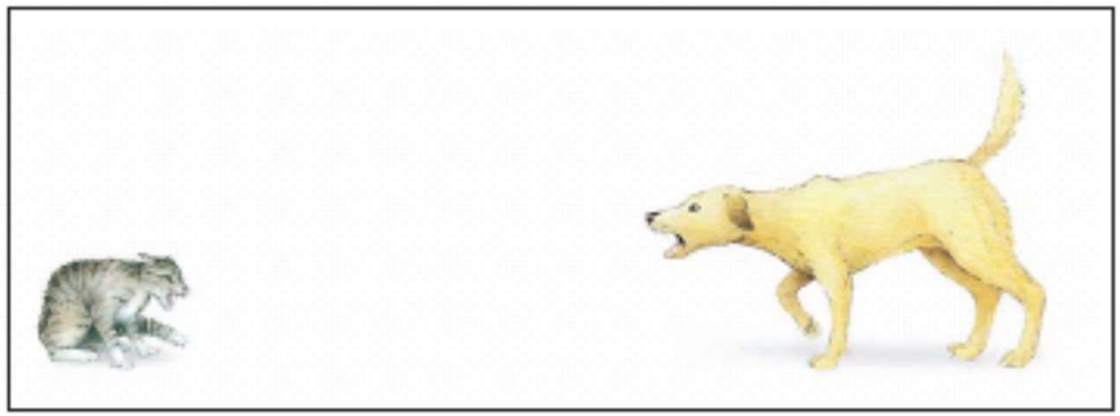

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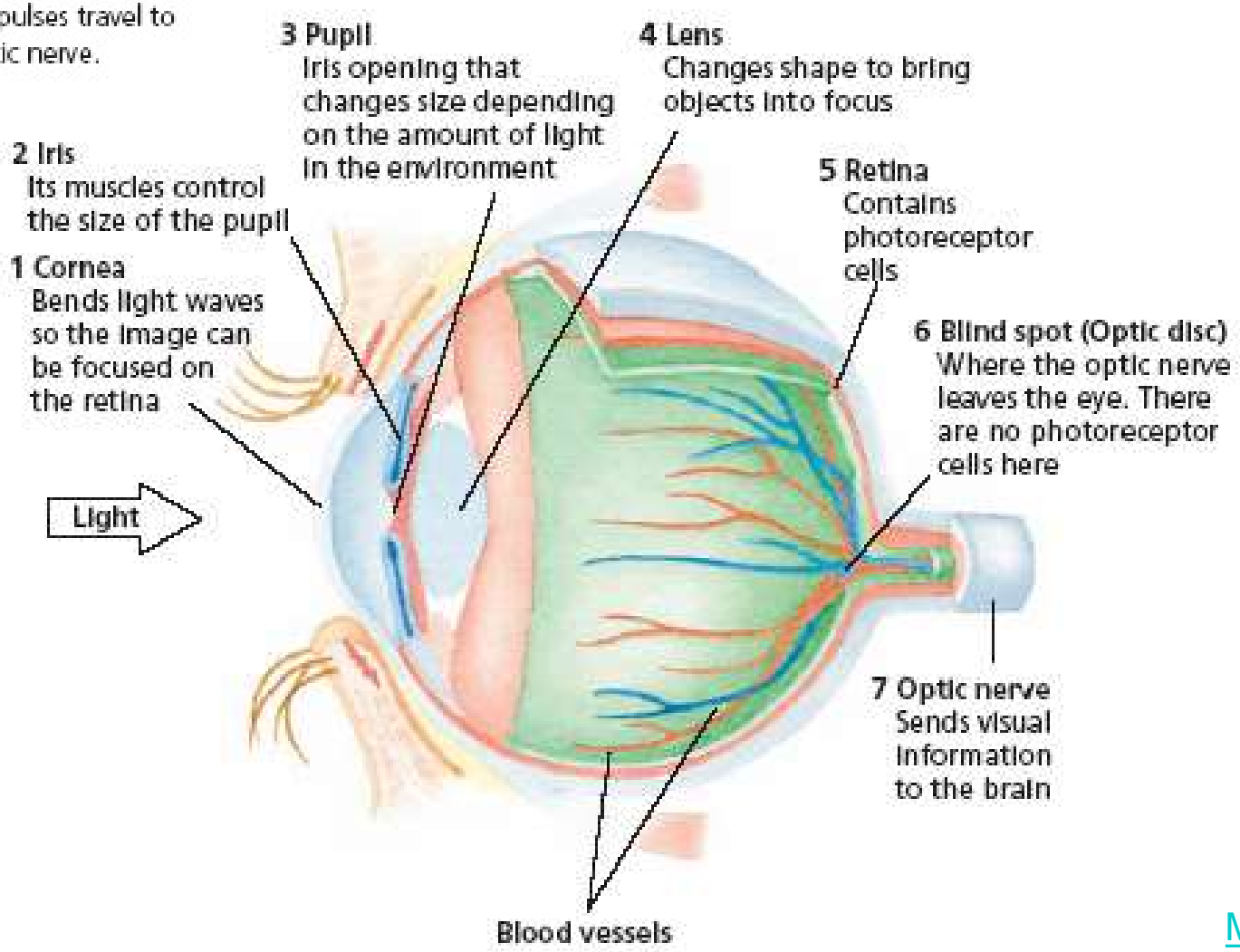
FIGURE 3.2 **Structure of the Eye**
Light enters the eye through the cornea and pupil. The iris controls the size of the pupil. From the pupil, light passes through the lens to the retina, where it is transformed into nerve impulses. The nerve impulses travel to the brain along the optic nerve.

LO 3.4 Parts of the eye

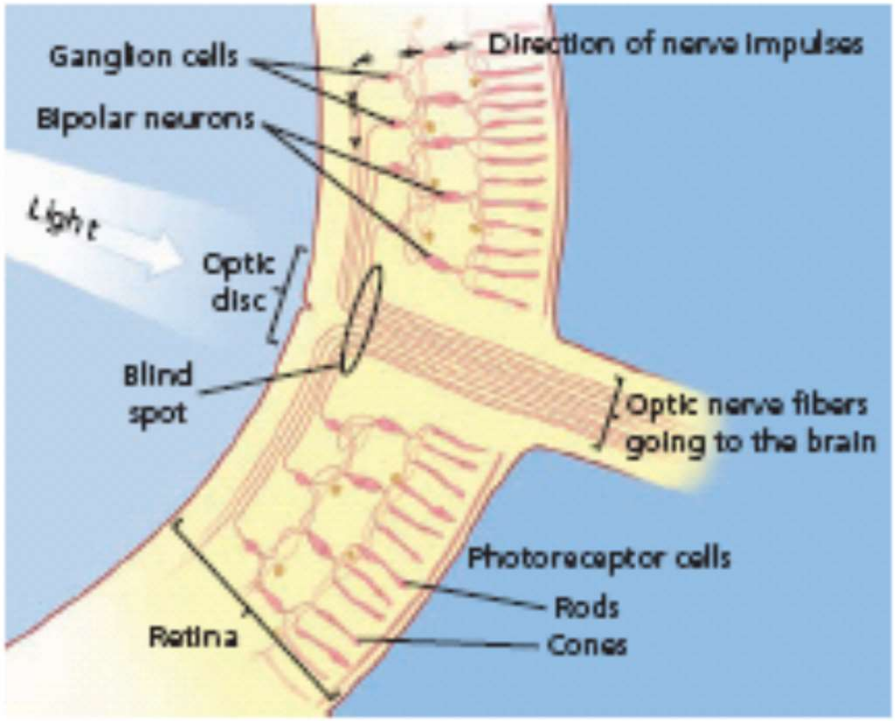

3 Pupil
Iris opening that changes size depending on the amount of light in the environment
4 Lens
Changes shape to bring objects into focus
2 Iris
Its muscles control the size of the pupil
5 Retina
Contains photoreceptor cells
1 Cornea
Bends light waves so the image can be focused on the retina
6 Blind spot (Optic disc)
Where the optic nerve leaves the eye. There are no photoreceptor cells here
Light
7 Optic nerve
Sends visual information to the brain
Blood vessels

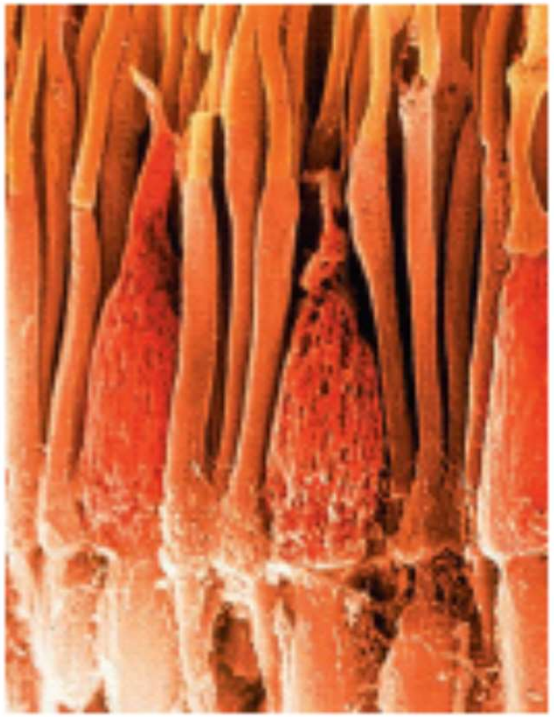
Menu

FIGURE 3.4 **The Parts of the Retina** (a) Light passes through ganglion and bipolar cells until it reaches and stimulates the rods and cones. Nerve impulses from the rods and cones travel along a nerve pathway to the brain. On the right of the figure is a photomicrograph of the long, thin rods and the shorter, thicker cones; the rods outnumber the cones by a ration of about twenty to one. (b) The blind spot

LO 3.4 Parts of the eye

a.





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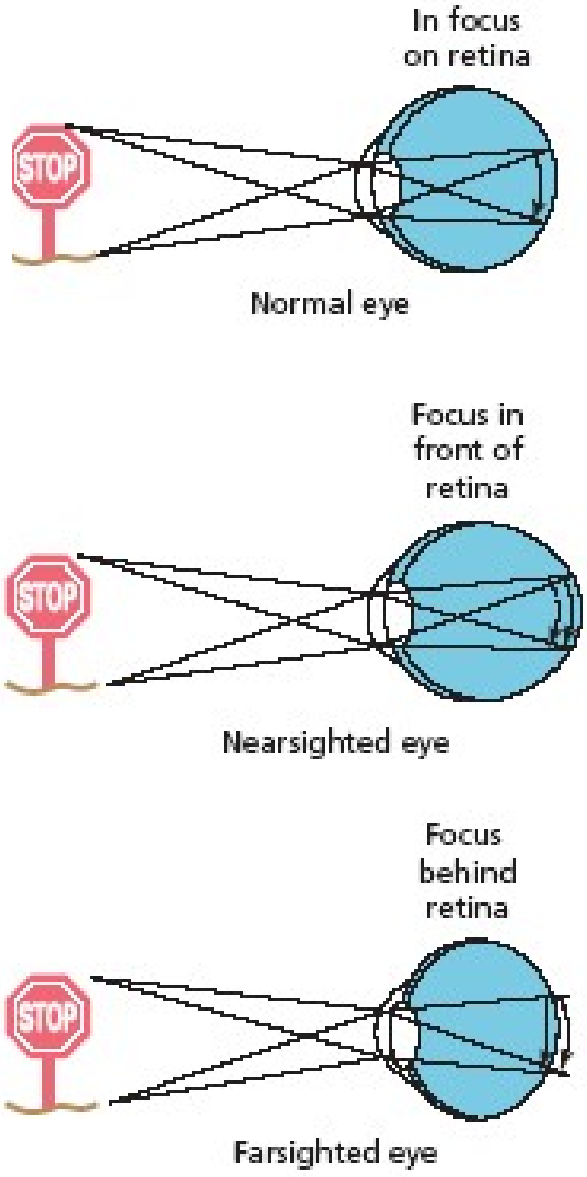
Parts of the eye

FIGURE 3.3 **Common Visual Problems: Nearsightedness and Farsightedness** This shows the problem of focusing on distant objects when the eyeball is too long (nearsightedness), and the problem of focusing on near objects when the eyeball is too short (farsightedness).



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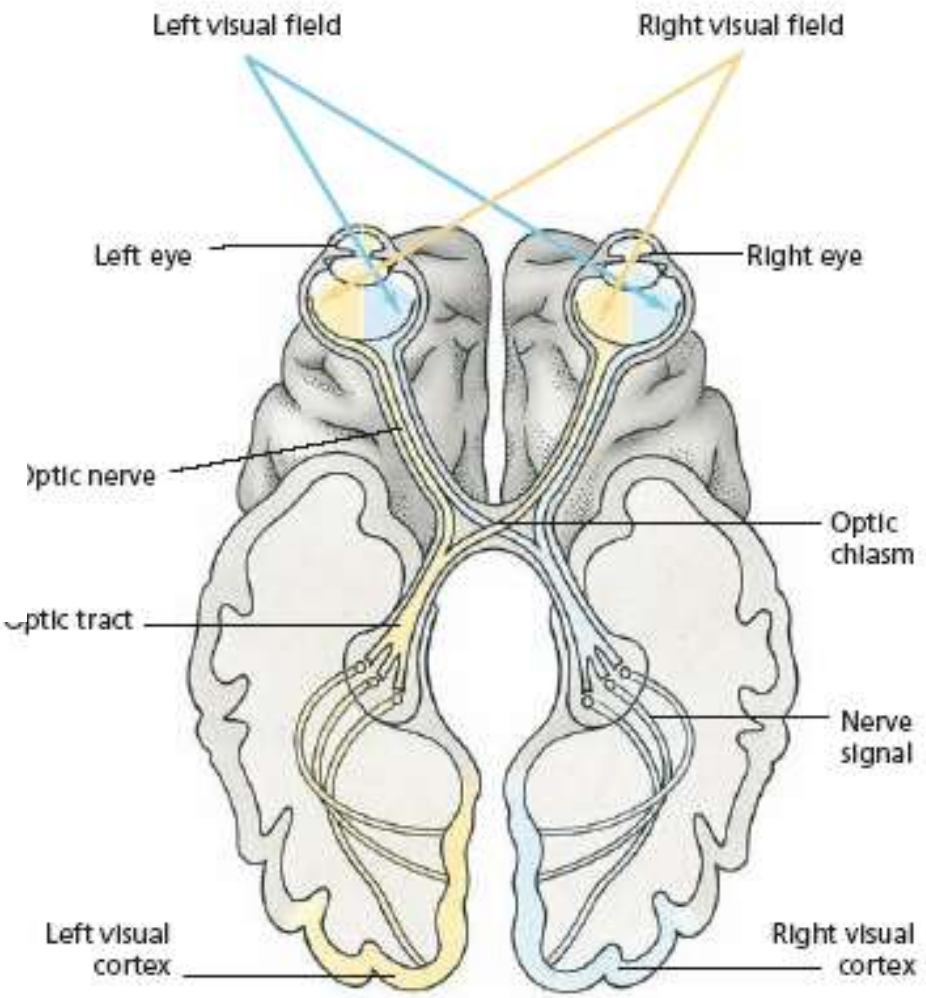
LO 3.5 How eyes see and how eyes see colors

FIGURE 3.5 **Crossing of the Optic Nerve** Light rays enter the eyes to fall upon the retina. Light falling upon the left side of each eye's retina (from the right visual field, shown in yellow) will stimulate a neural message that will travel along the optic nerve to the left visual cortex in the occipital lobe of the left hemisphere. Notice that the message from the left eye goes directly to the left occipital lobe, while the message from the right eye crosses over to the left hemisphere (the optic chiasm is the point of crossover). The optic nerve tissue from both eyes joins together to form the left optic tract before going on to the left occipital lobe. For the left visual field (shown in blue), the messages from both right sides of the retinas will travel along the right optic track to the right visual cortex in the same manner.



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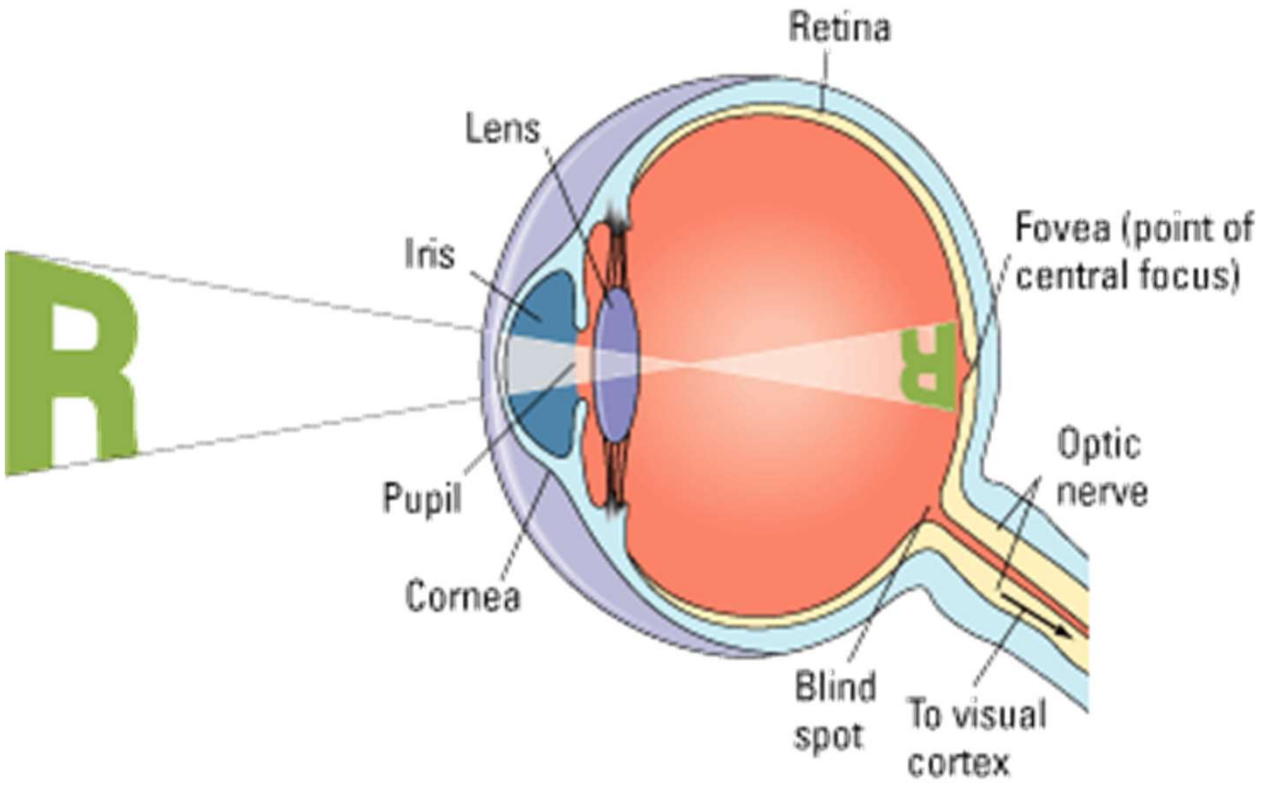
LO 3.5 How eyes see and how eyes see colors



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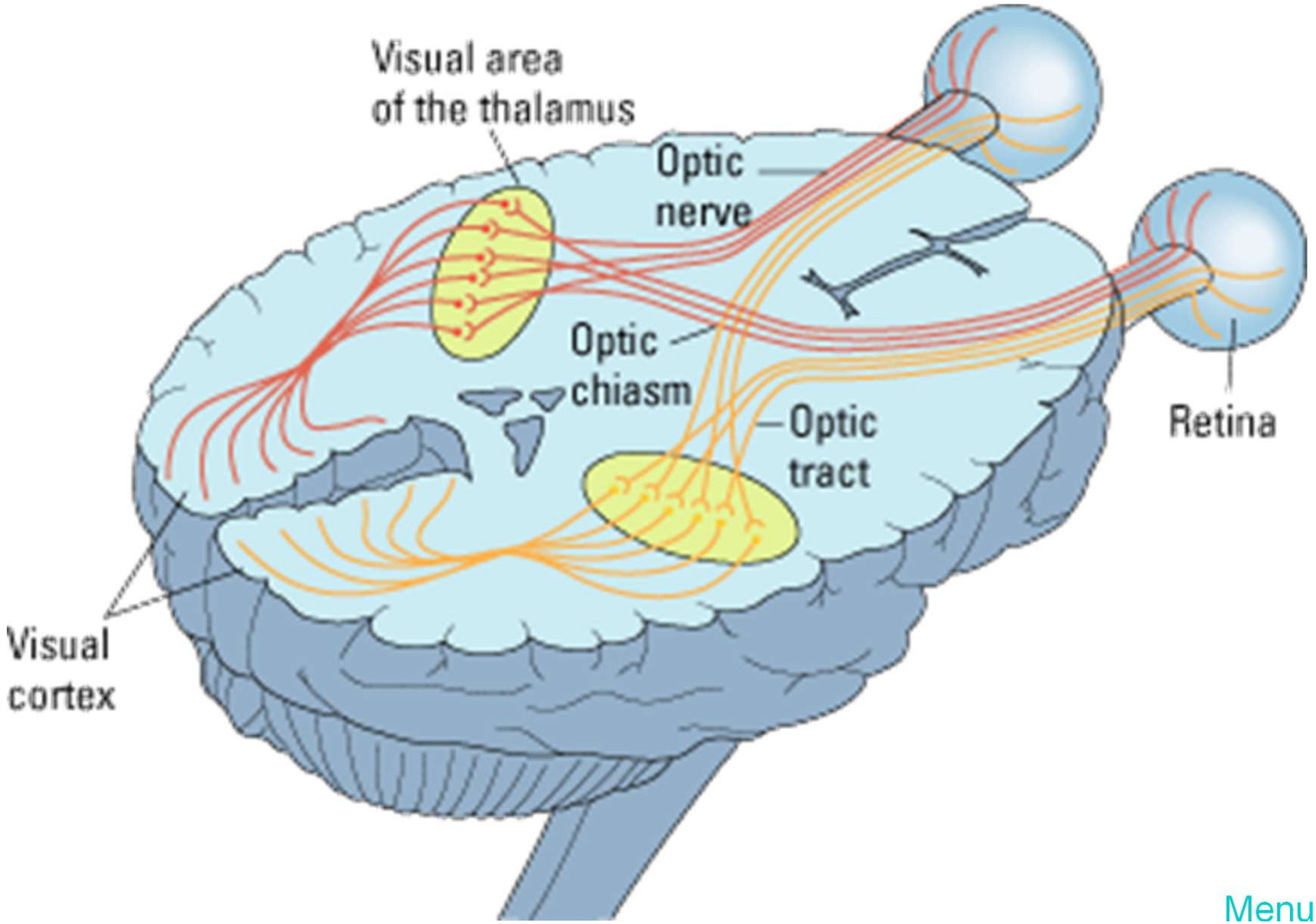
LO 3.5 How eyes see and how eyes see colors



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LO 3.5 How eyes see and how eyes see colors

In trichromatic theory, the three types of cones combine to form different colors much as these three colored lights combine.

Menu

How the Eyes Work

- Dark adaptation - the recovery of the eye's sensitivity to visual stimuli in darkness after exposure to bright lights.
  - Night blindness
- Light adaptation - the recovery of the eye's sensitivity to visual stimuli in light after exposure to darkness.

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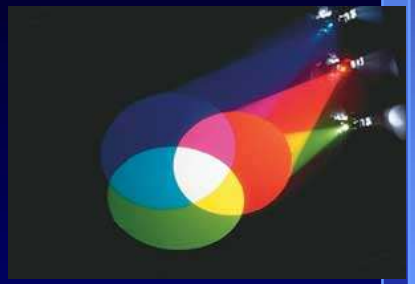
Color Vision



- Trichromatic theory - theory of color vision that proposes three types of cones: red, blue, and green.
- Afterimages - images that occur when a visual sensation persists for a brief time even after the original stimulus is removed.
- Opponent-process theory - theory of color vision that proposes four primary colors with cones arranged in pairs: red and green, blue and yellow.
  - Lateral geniculate nucleus (LGN) of thalamus

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LO 3.5 How eyes see and how eyes see colors

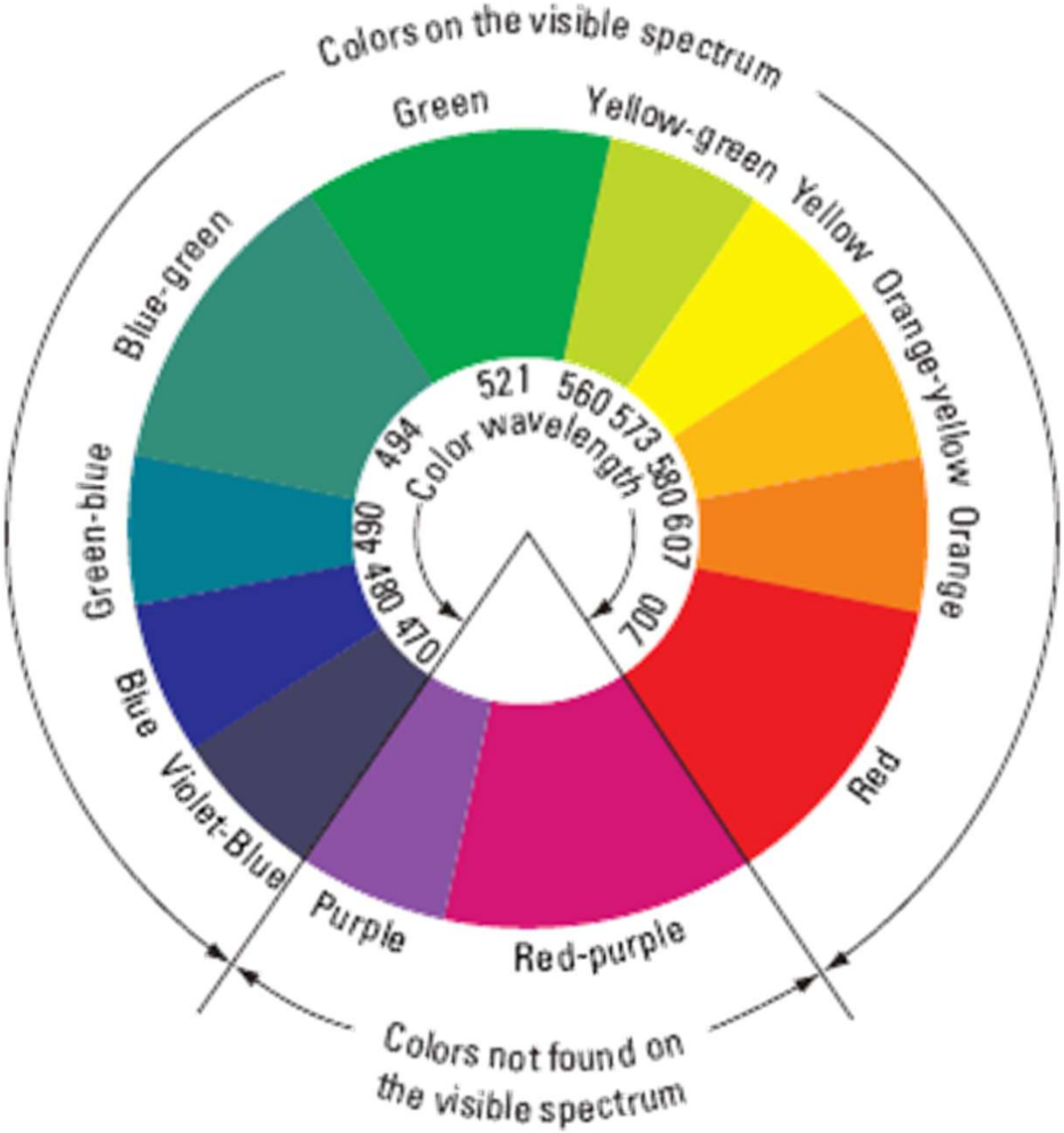

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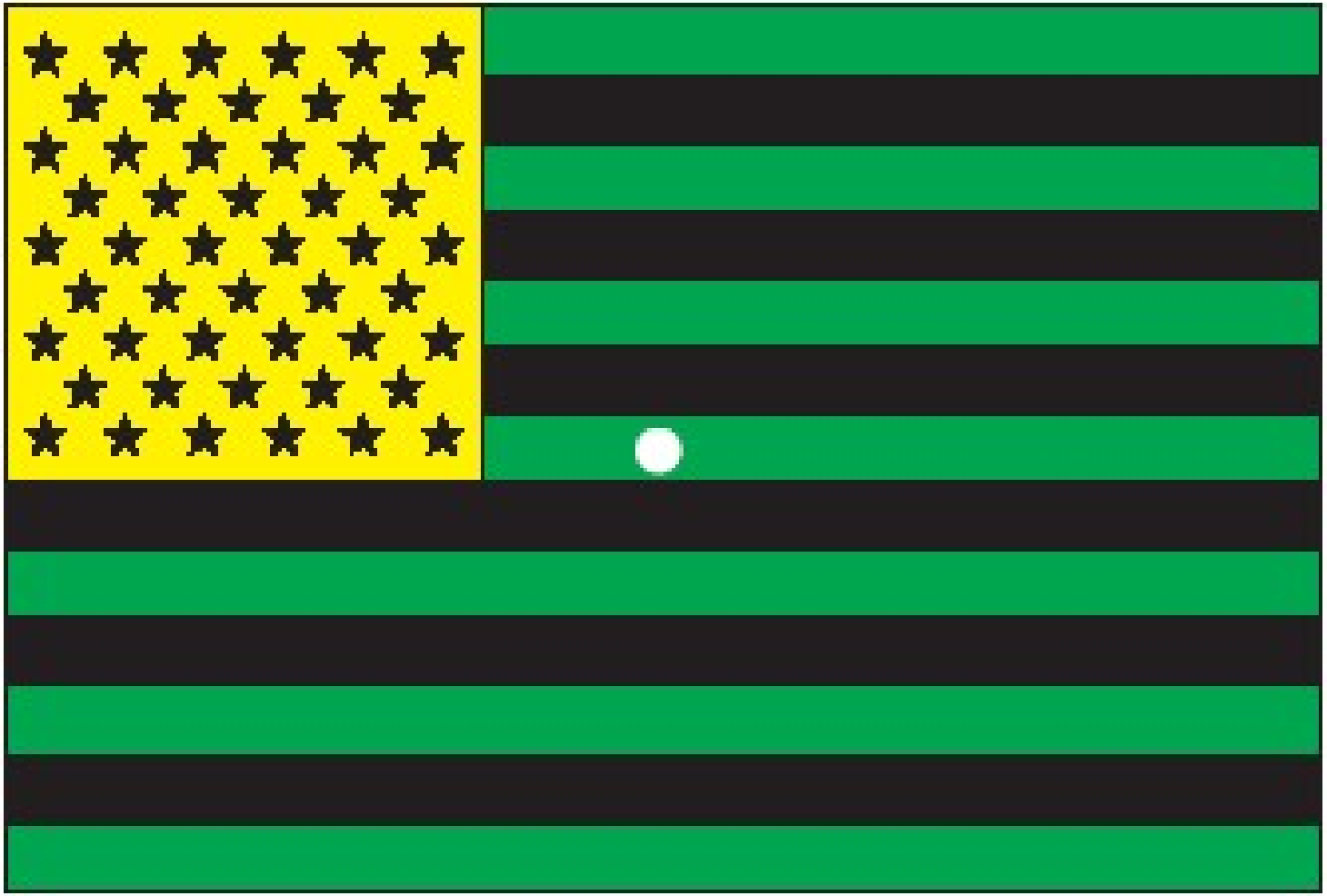
FIGURE 3.6 **Color Afterimage**
Stare at the white dot in the center of this oddly colored flag for about thirty seconds. Now look at a white piece of paper or a white wall. Notice that the colors are now the normal, expected colors of the American flag. They are also the primary colors that are opposites of the colors in the picture, and evidence for the opponent process theory of color vision.

LO 3.5 How eyes see and how eyes see colors



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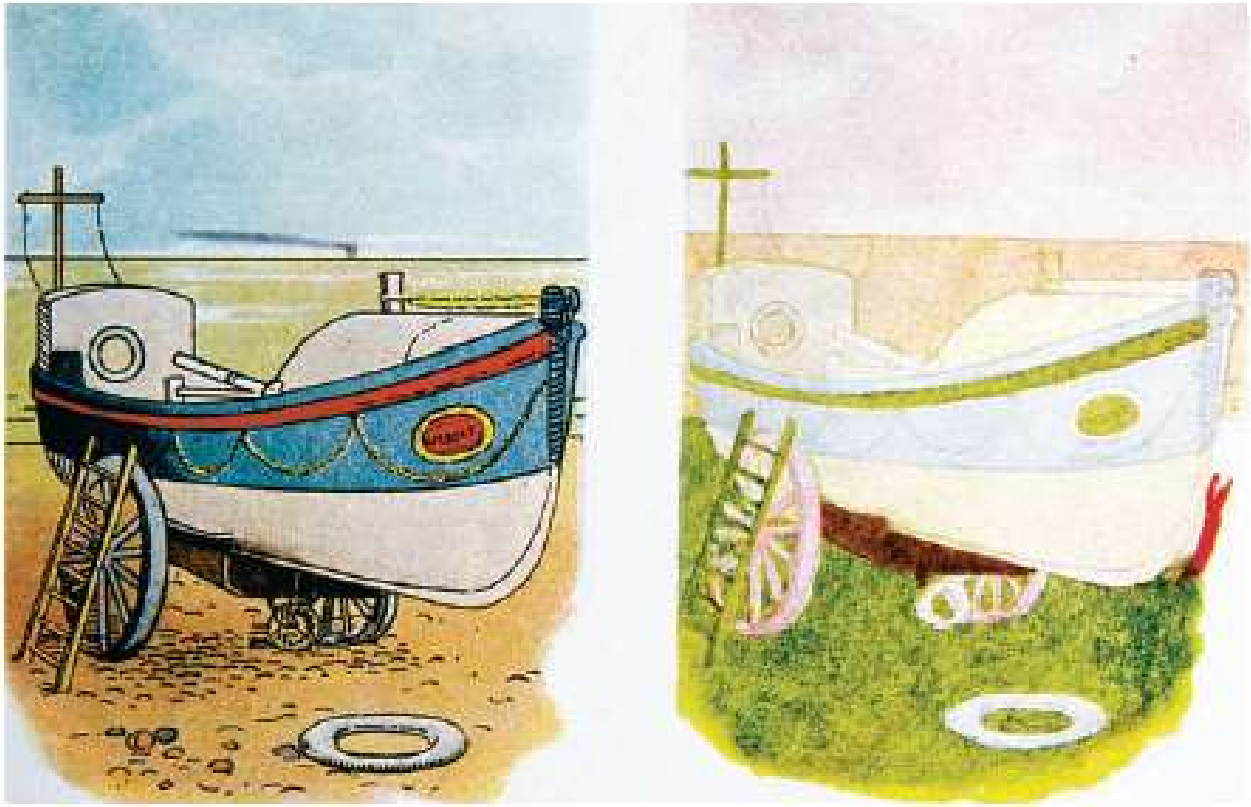
Color Blindness

- Monochrome colorblindess - either have no cones or have cones that are not working at all.
- Red-green colorblindess - either the red or the green cones are not working.
- Sex-linked inheritance.

Menu

LO 3.5 How eyes see and how eyes see colors

The painting on the left was done by a person with normal (trichromatic) color vision. The painting on the right was done by a person with dichromatic red-green color blindness.
Source: From Oliver Sacks's story "The Case of the Colorblind Person" in his book *An Anthropologist on Mars* (19

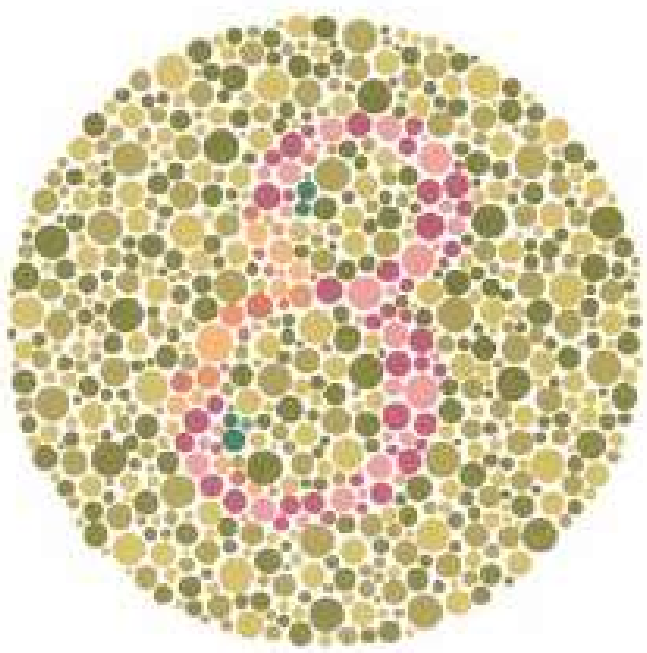


This is the same scene painted by a *monochromat*, a person who sees no color at all. Although some monochromats have no functioning cones and see very poorly, others are like this person and have some functioning cones allowing them to have visual acuity.

Menu

FIGURE 3.7 **The Ishihara Color Test** In the circle on the left, the number 8 is visible only to those with normal color vision. In the circle on the right, people with normal vision will see the number 96, while those with red-green color blindness will see nothing but a circle of dots.

LO 3.5 How eyes see and how eyes see colors



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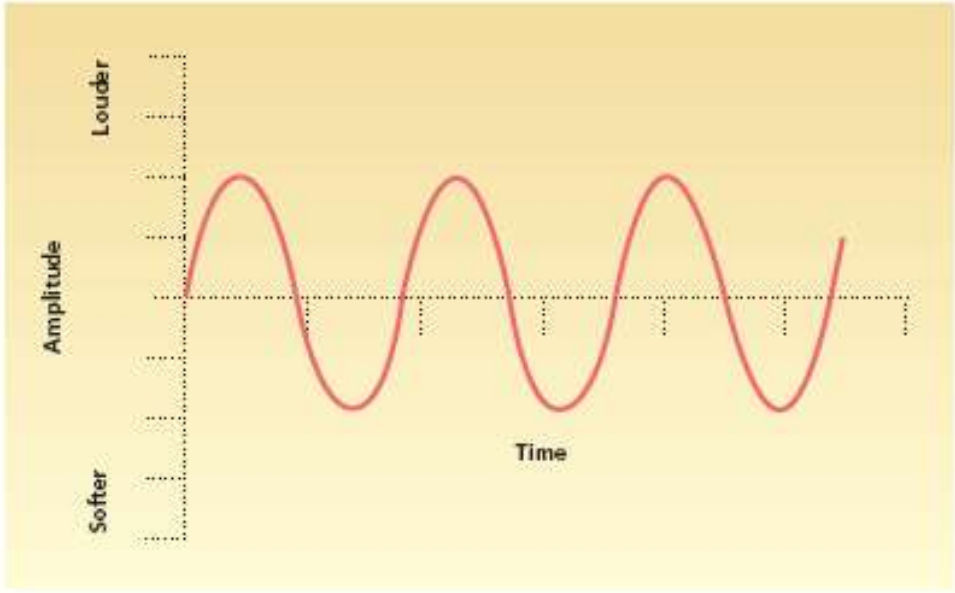
Psychological Properties of Sound

- Wavelength – interpreted as frequency or pitch (high, medium, or low).
- Amplitude – interpreted as volume (how soft or loud a sound is).
- Purity – interpreted as timbre (a richness in the tone of the sound).
- hertz (Hz) - cycles or waves per second, a measurement of frequency.

Menu

LO 3.6 Sound

FIGURE 3.8 **Sound Waves and Decibels** (a) A typical sound wave. The higher the wave, the louder the sound; the lower the wave, the softer the sound. If the waves are close together in time (high frequency), the pitch will be perceived as a high pitch. Waves that are farther apart (low frequency) will be perceived as having a lower pitch. (b) Decibels of various stimuli. A *decibel* is a unit of measure for loudness. Psychologists study the effects that noise has on stress, learning, performance, aggression, and psychological and physical well-being. Research on the hazards of loud noises led the National Basketball Association to put an 85-decibel limit on the sound system played at basketball arenas (Heisler, 1995).



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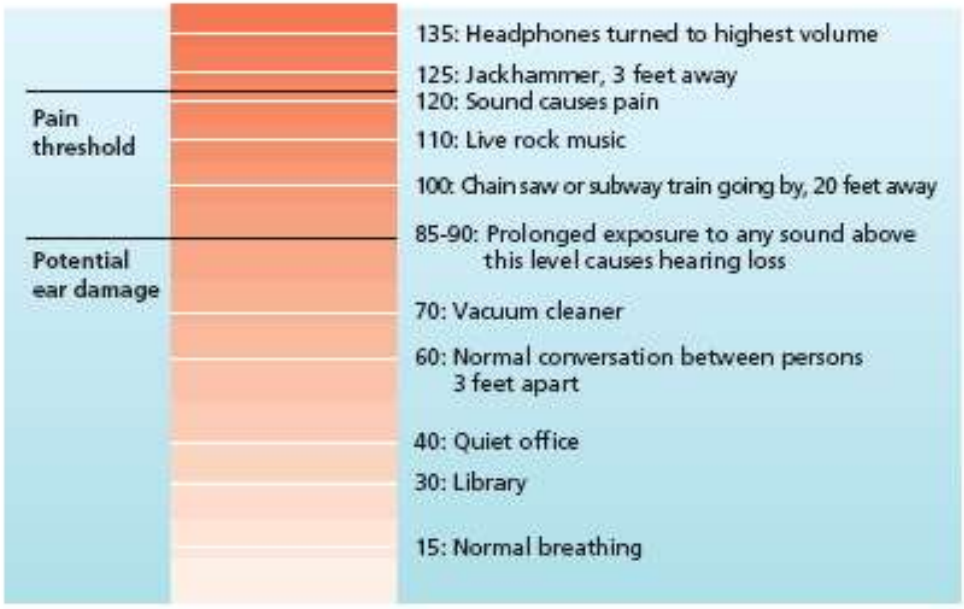
Pain threshold
Potential ear damage
135: Headphones turned to highest volume
125: Jackhammer, 3 feet away
120: Sound causes pain
110: Live rock music
100: Chain saw or subway train going by, 20 feet away
85-90: Prolonged exposure to any sound above this level causes hearing loss
70: Vacuum cleaner
60: Normal conversation between persons 3 feet apart
40: Quiet office
30: Library
15: Normal breathing

b.

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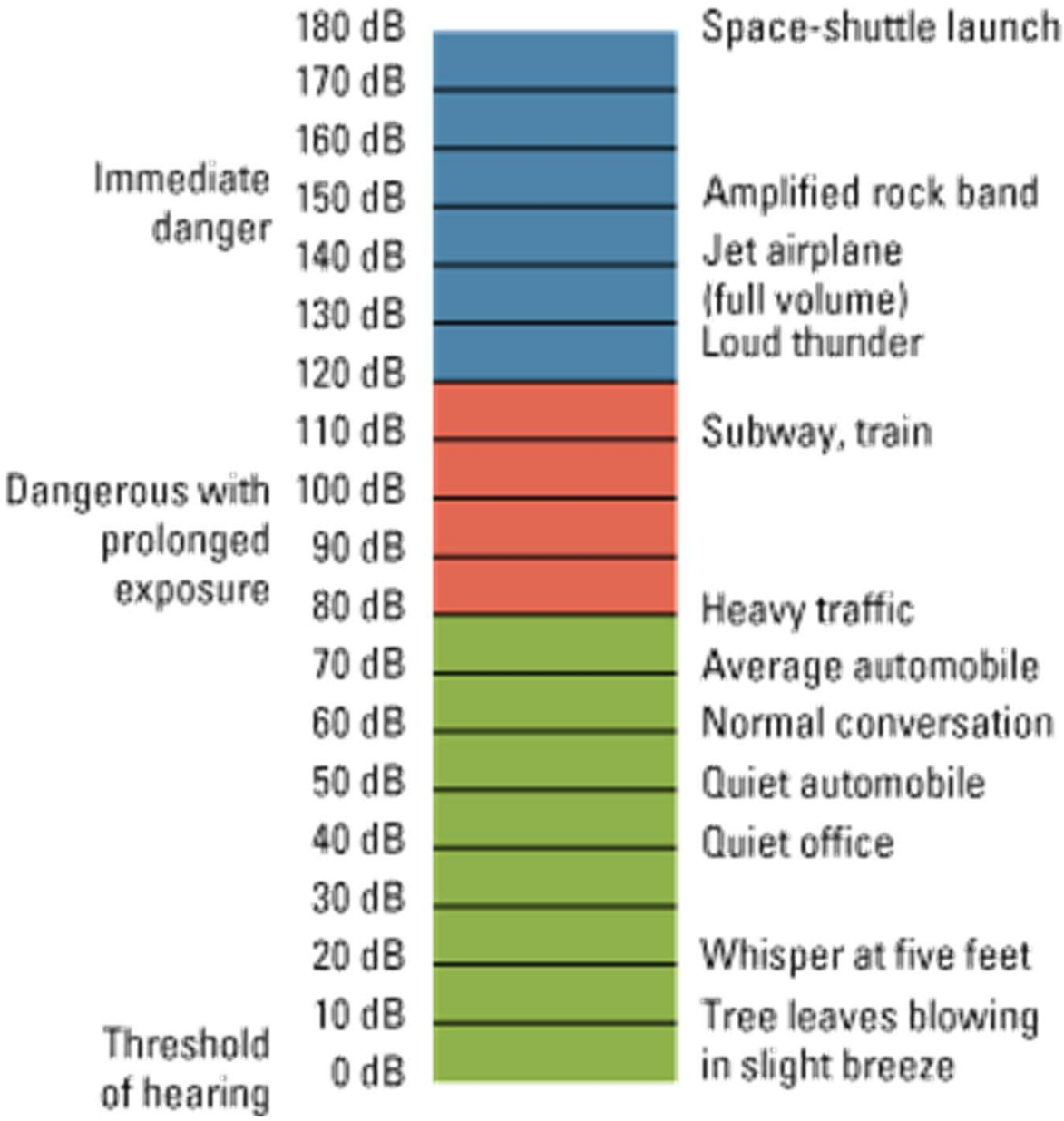

180 dB
170 dB
160 dB
150 dB
140 dB
130 dB
120 dB
110 dB
100 dB
90 dB
80 dB
70 dB
60 dB
50 dB
40 dB
30 dB
20 dB
10 dB
0 dB
Immediate danger
Dangerous with prolonged exposure
Threshold of hearing
Space-shuttle launch
Amplified rock band
Jet airplane (full volume)
Loud thunder
Subway, train
Heavy traffic
Average automobile
Normal conversation
Quiet automobile
Quiet office
Whisper at five feet
Tree leaves blowing in slight breeze

Menu

Structure of the Ear

- Auditory canal - short tunnel that runs from the pinna to the eardrum (tympanic membrane).
- Eardrum - thin section of skin that tightly covers the opening into the middle part of the ear, just like a drum skin covers the opening in a drum.
  - When sound waves hit the eardrum, it vibrates and causes three tiny bones in the middle ear to vibrate.
    - Hammer
    - Anvil
    - Stirrup

Menu

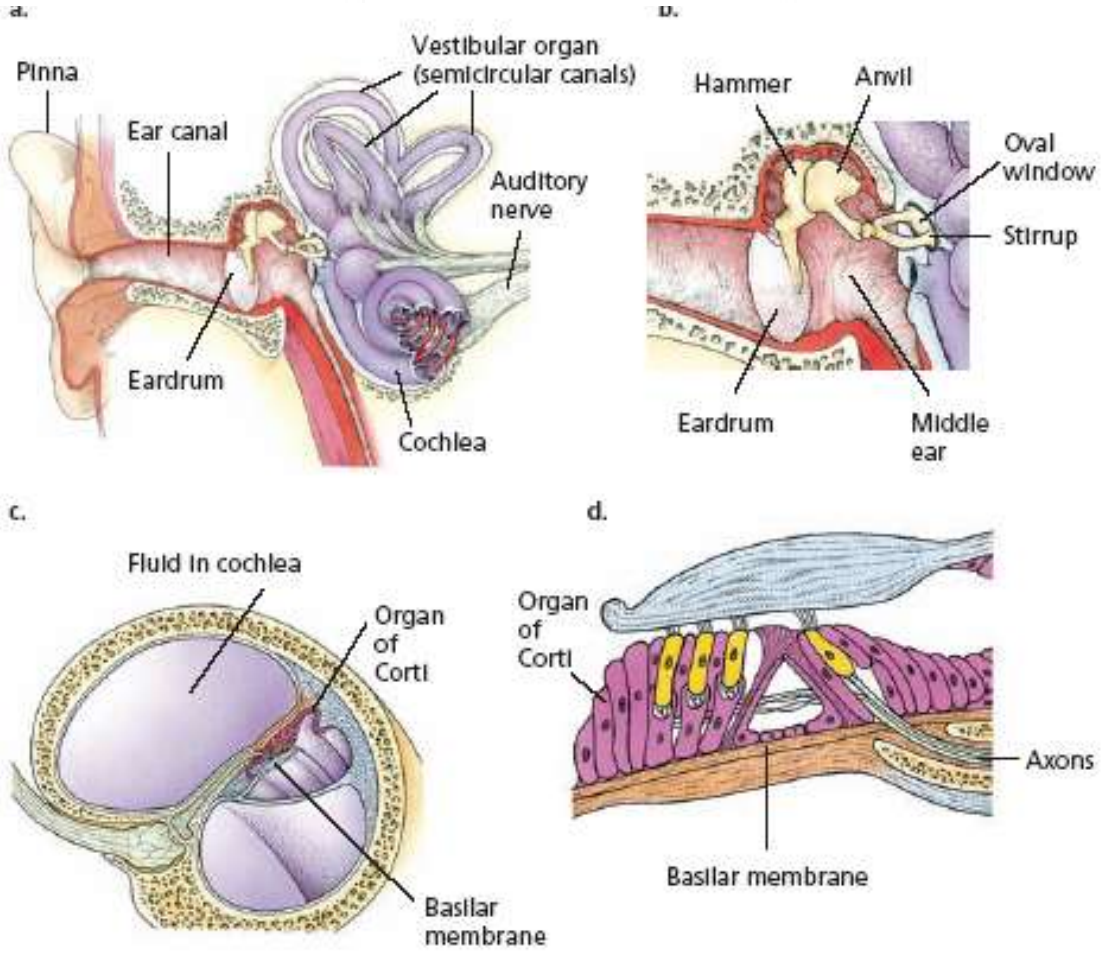
Structure of the Ear

- Cochlea - snail-shaped structure of the inner ear that is filled with fluid.
- Organ of Corti – rests in the basilar membrane; contains receptor cells for sense of hearing.
- Auditory nerve - bundle of axons from the hair cells in the inner ear; receives neural message from the organ of Corti.

Menu

FIGURE 3.9 **The Structure of the Ear** (a) This figure shows the entire ear, beginning with the outer ear (pinna, ear canal, and eardrum). The vestibular organ includes the semicircular canals and the otolith organs (inside the round structures just above the cochlea). (b) The middle ear. Sound waves entering through the ear canal cause the eardrum to vibrate, which causes each of the three bones of the middle ear to vibrate, amplifying the sound. The stirrup rests upon the oval window, which transmits its vibration to the fluid in the inner ear. (c) The inner ear. Large spaces are filled with fluid (shown in purple) that vibrates as the oval window vibrates. A thin membrane suspended in this fluid is called the basilar membrane, which contains the organ of Corti, the structure composed of the hair-like cells that send signals to the auditory cortex of the brain by way of the auditory nerve. (d) A close-up view of the basilar membrane (in brown) with the hair cells of the organ of Corti (in dark purple). Notice the axons (small black lines) leaving the hair cells to form the auditory nerve.

LO 3.7 Parts of ear work together to hear sounds



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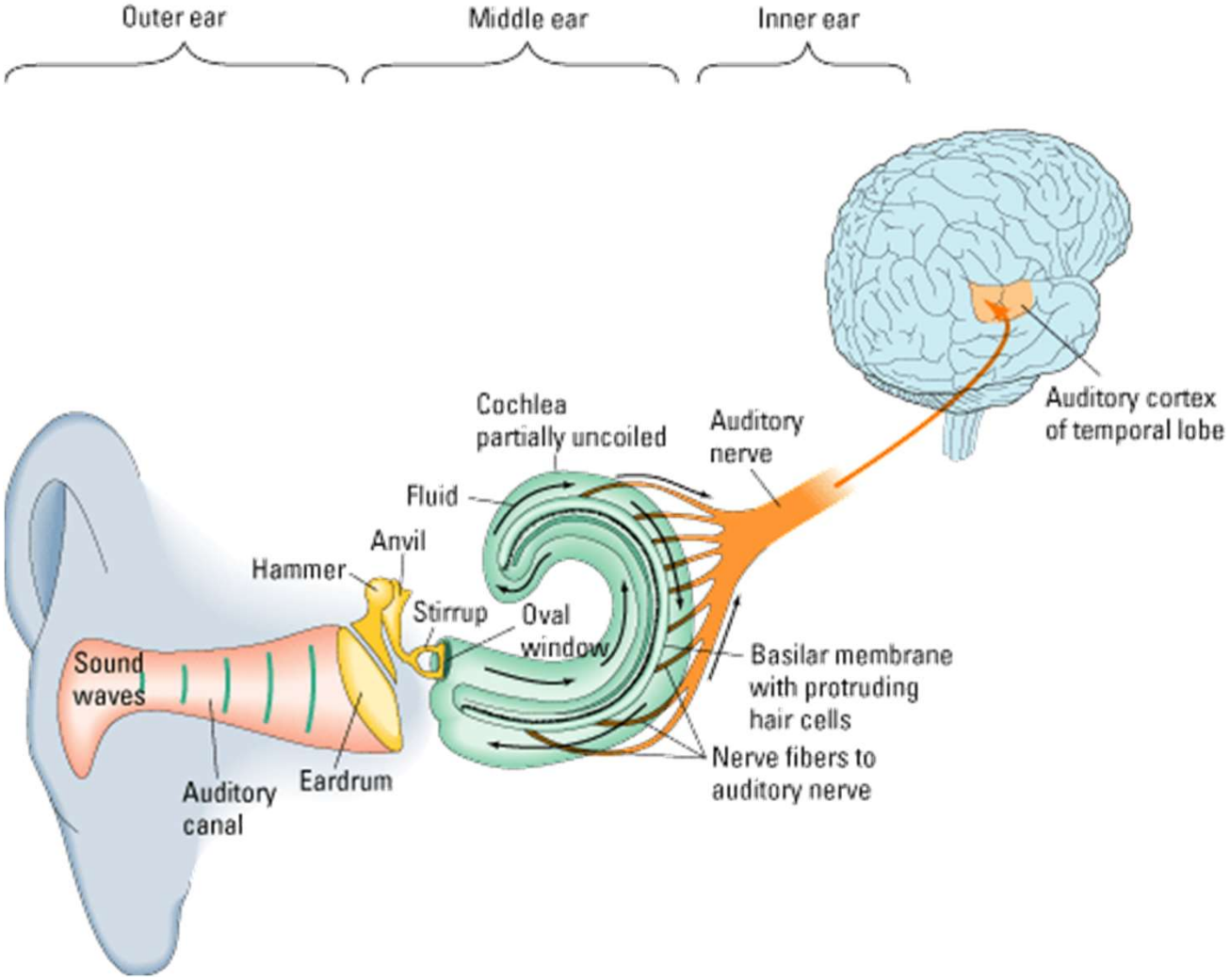
LO 3.7 Parts of ear work together to hear sounds



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Theories of Pitch

- Pitch - psychological experience of sound that corresponds to the frequency of the sound waves; higher frequencies are perceived as higher pitches.
- Place theory - theory of pitch that states that different pitches are experienced by the stimulation of hair cells in different locations on the organ of Corti.

Menu

Theories of Pitch

- Frequency theory - theory of pitch that states that pitch is related to the speed of vibrations in the basilar membrane volley principle theory of pitch that states that frequencies above 100 Hz cause the hair cells (auditory neurons) to fire in a volley pattern, or take turns in firing.
- Volley principle - theory of pitch that states that frequencies above 100 Hz cause the hair cells (auditory neurons) to fire in a volley pattern, or take turns in firing.

Menu

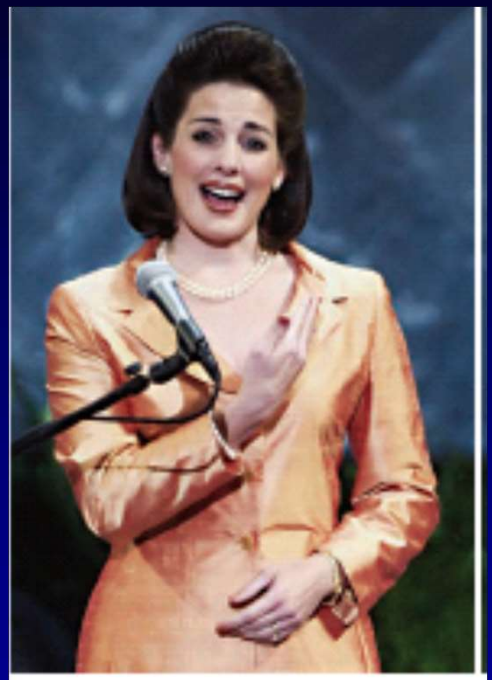
Types of Hearing Impairments

- Conduction hearing impairment - can result from either:
  - damaged eardrum (which would prevent sound waves from being carried into the middle ear properly), or
  - damage to the bones of the middle ear (sounds cannot be conducted from the eardrum to the cochlea).
- Nerve hearing impairment – can result from either:
  - damage in the inner ear, or
  - damage in the auditory pathways and cortical areas of the brain.

Menu

Surgery to Help Restore Hearing

- Cochlear Implant - a microphone implanted just behind the ear picks up sound from the surrounding environment.
  - Speech processor selects and arranges the sound picked up by the microphone.
  - Implant is a transmitter and receiver, converting signals into electrical impulses.
    - Collected by the electrode array in the cochlea and then sent to the brain.



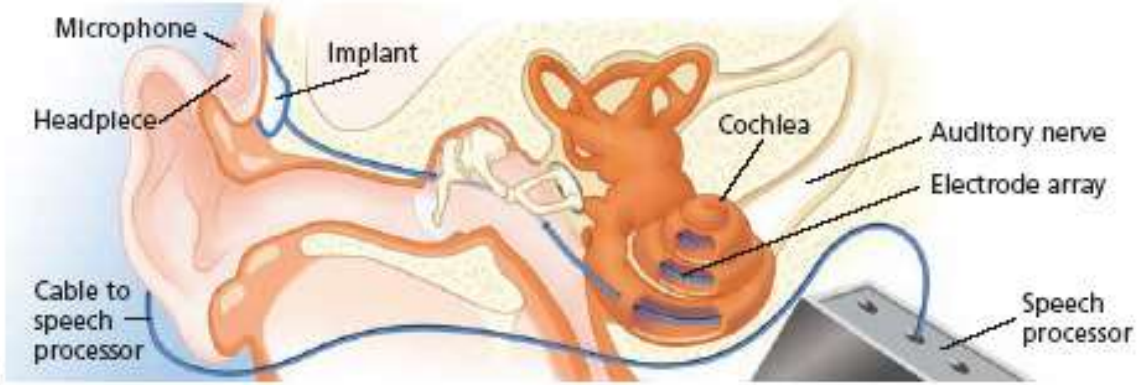
Former Miss America Heather Whitestone McCallum signing as she gives a speech. Heather McCallum remains active in the deaf community even though she now has some hearing by means of a cochlear implant.

Menu

LO 3.9 Helping people with hearing impairment

FIGURE 3.10 **Cochlear Implant**
In a cochlear implant, a microphone implanted just behind the ear picks up sound from the surrounding environment. A speech processor, attached to the implant and worn outside the body, selects and arranges the sound picked up by the microphone. The implant itself is a transmitter and receiver, converting the signals from the speech processor into electrical impulses which are collected by the electrode array in the cochlea and then sent to the brain. This child is able to hear with the help of a cochlear implant. Hearing spoken language during the early years of a child's life helps in the development of the child's own speech.

a.

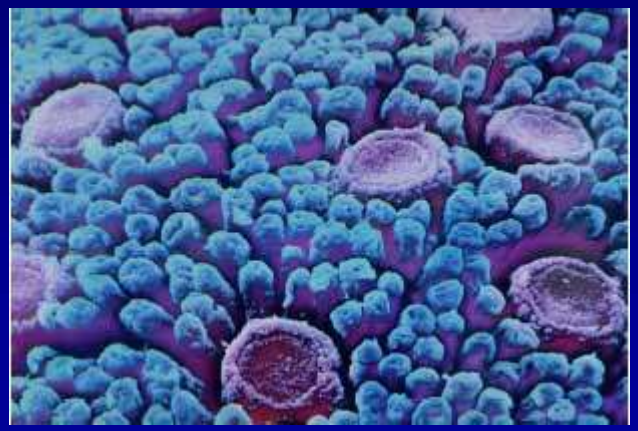


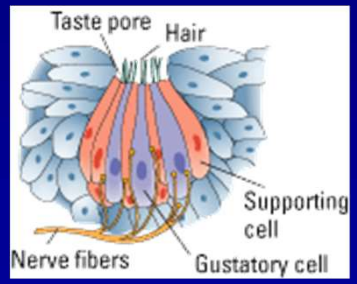
b.

Menu

Taste

- Taste buds – taste receptor cells in mouth; responsible for sense of taste
- Gustation - the sensation of a taste.
- Five Basic Tastes:
  - Sweet
  - Sour
  - Salty
  - Bitter
  - “Brothy”





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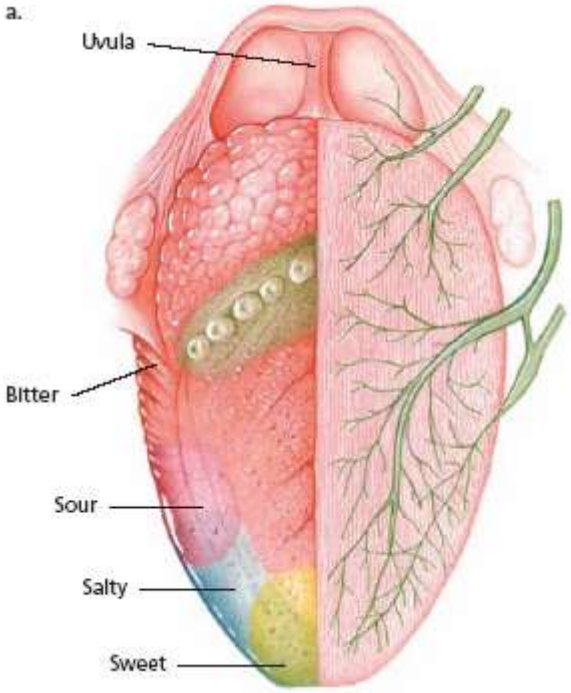
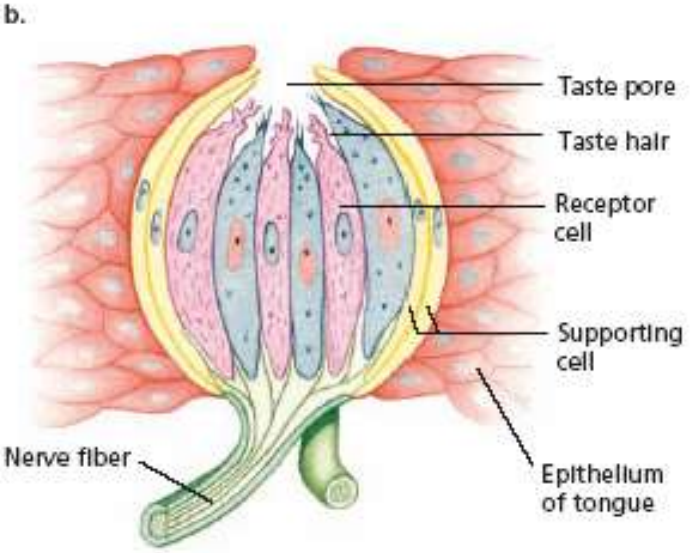
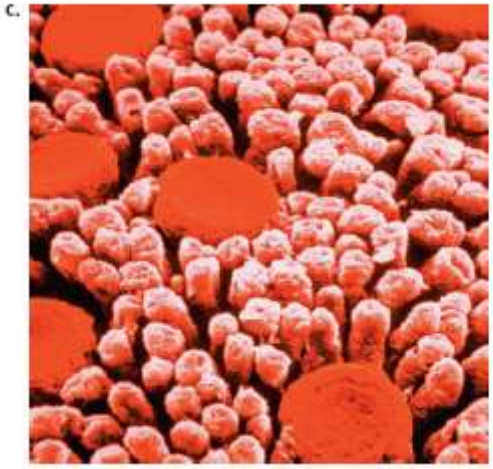
LO 3.10 Senses of taste and smell

FIGURE 3.11 **The Tongue and Taste Buds—A Crosscut View of the Tongue** (a) The right side of this drawing shows the nerves in the tongue's deep tissue, while the left side shows the different regions of taste sensitivity. The front of the tongue is where sweet tastes are detected (yellow); salty is processed along the sides (blue); sour is processed on the side near the middle (pink); and bitter is processed at the back (dark green). (b) The taste bud is located inside the papillae, and is composed of several small cells (in pink and blue) that send signals to the brain when stimulated by molecules of food. (c) Microphotograph of the surface of the tongue, showing two different sizes of papillae. The taste buds are located under the surface of the larger red papillae, whereas the smaller and more numerous papillae form a touch-sensitive rough surface that helps in chewing and moving food around the mouth.







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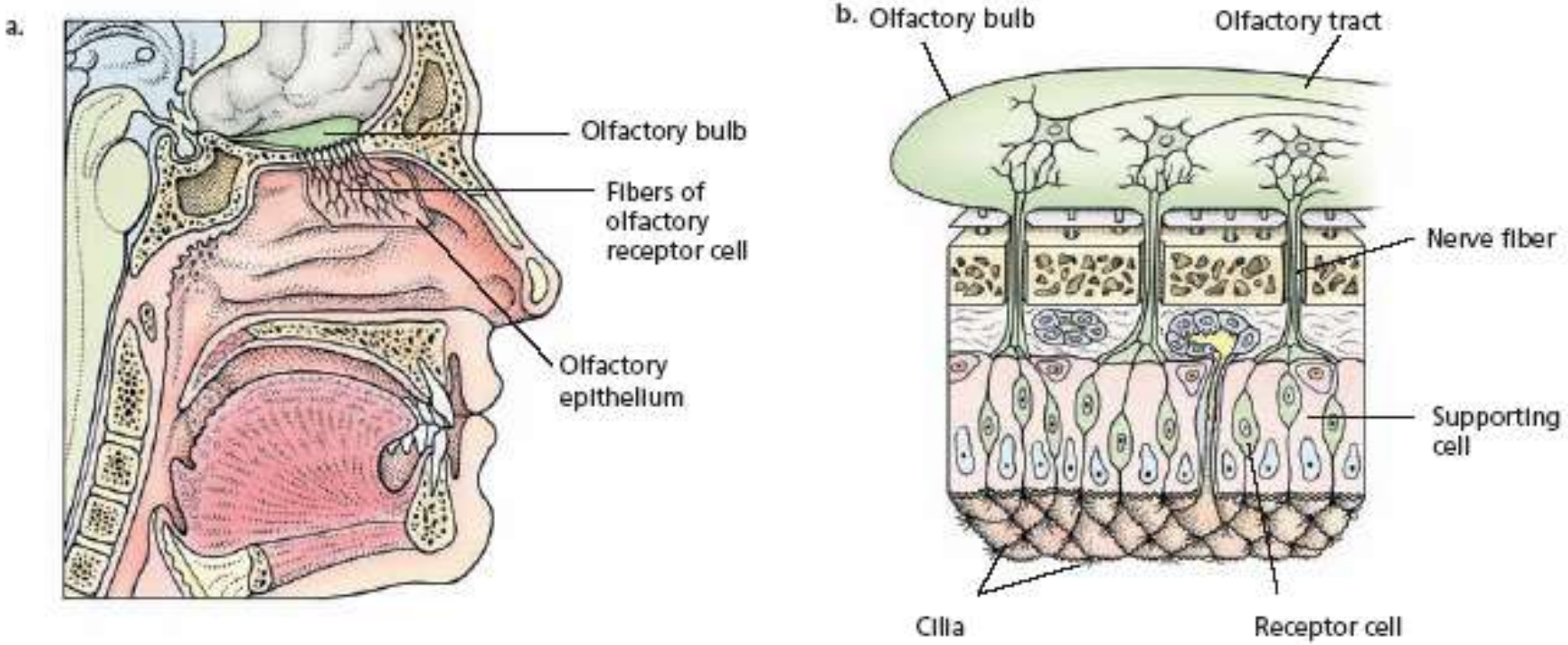
Smell

- Olfaction (olfactory sense) – sense of smell.
- Olfactory bulbs - areas of the brain located just above the sinus cavity and just below the frontal lobes that receive information from the olfactory receptor cells.
- At least 1,000 olfactory receptors.

Menu

LO 3.10 Senses of taste and smell

FIGURE 3.12 **The Olfactory Receptors** (a) A cross section of the nose and mouth. This drawing shows the nerve fibers inside the nasal cavity that carry information about smell directly to the olfactory bulb just under the frontal lobe of the brain (shown in green). (b) A diagram of the cells in the nose that process smell. The olfactory bulb is on top, shown in green. Notice the tiny hair-like cells that project into the nasal cavity. These are the receptors for the sense of smell.



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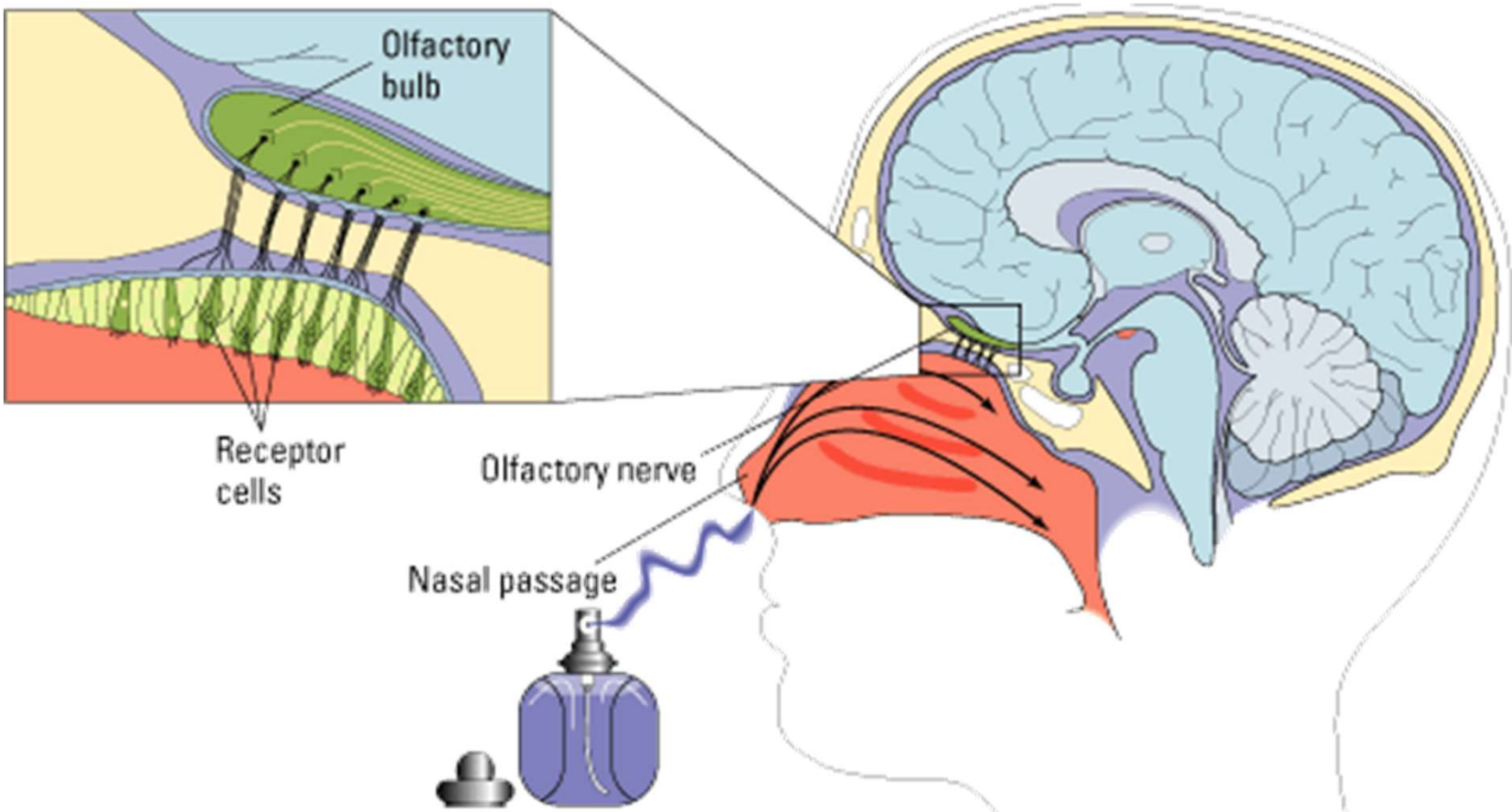
LO 3.10 Senses of taste and smell



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Somesthetic Senses

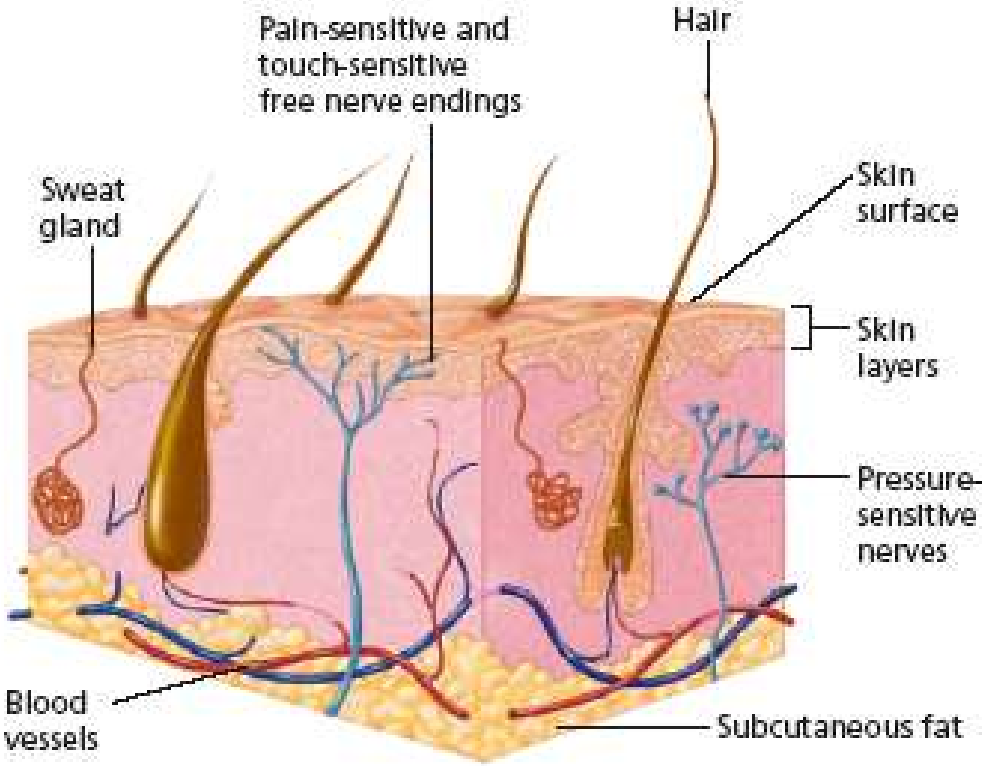
- Somesthetic senses - the body senses consisting of the skin senses, the kinesthetic sense, and the vestibular senses.
  - "Soma" – body
  - "Esthetic" - feeling

1. Skin senses - the sensations of touch, pressure, temperature, and pain.
   - Sensory receptors in the skin
   - Gate-control theory - pain signals must pass through a "gate" located in the spinal cord.

Menu

FIGURE 3.13 **Cross Section of the Skin and Its Receptors** The skin is composed of several types of cells that process pain, pressure, and temperature. Some of these cells are wrapped around the ends of the hairs on the skin and are sensitive to touch on the hair itself, while others are located near the surface and still others just under the top layer of tissue.

LO 3.11 Sense of touch and experiencing pain



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Her sense of touch is allowing this blind girl to "read" a Braille book with her fingers. The fingertips are extremely sensitive to fine differences in texture, allowing her to distinguish between small dots representing the different letters of the alphabet.

LO 3.11 Sense of touch and experiencing pain

Menu

Anhidrosis is a rare genetic disorder that makes 5-year-old Ashlyn unable to feel pain. She must be examined carefully for scrapes and cuts after recess at school because she cannot feel when she hurts herself, putting her at risk for infection. What are some of the problems that Ashlyn and her parents may face as she grows older?

LO 3.11 Sense of touch and experiencing pain

Menu

LO 3.11 Sense of touch and experiencing pain

When people grasp two braided pipes–one with cold water running through it, the other with warm water–the sensation is "very hot" and painful.

Menu

LO 3.12 Senses that allow body to know it is moving and balanced

Somesthetic Senses

2. Kinesthetic sense - sense of the location of body parts in relation to the ground and each other.
   - Proprioceptive receptors (proprioceptors)
3. Vestibular senses - the sensations of movement, balance, and body position sensory conflict theory an explanation of motion sickness in which the information from the eyes conflicts with the information from the vestibular senses, resulting in dizziness, nausea, and other physical discomforts.

Menu

These young Chinese acrobats are balancing real glasses and each other in an amazing feat of coordination and muscular control. They must not only use their vestibular organs to help maintain their balance, but also their kinesthetic sense to be aware of exactly where each body part is in relation to the others.

LO 3.12 Senses that allow body to know it is moving and balanced

Menu

Perception and Constancies

- Perception - the method by which the sensations experienced at any given moment are interpreted and organized in some meaningful fashion.
- Size constancy - the tendency to interpret an object as always being the same actual size, regardless of its distance.
- Shape constancy - the tendency to interpret the shape of an object as being constant, even when its shape changes on the retina.
- Brightness constancy – the tendency to perceive the apparent brightness of an object as the same even when the light conditions change.

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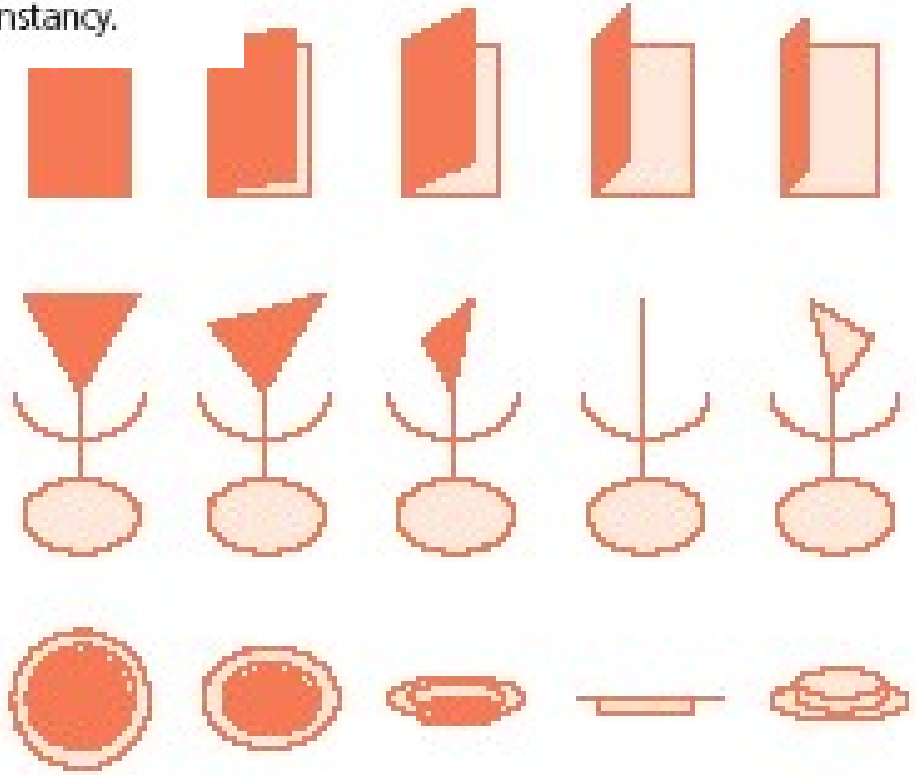
FIGURE 3.14 **Shape Constancy**
Three examples of shape constancy are shown here. The opening door is actually many different shapes, yet we still see it as basically a rectangular door. We do the same thing wth a triangle and a circle—although when we look at them from different angles they cast quite differently shaped images on our retina, we experience them as a triangle and a circle because of shape constancy.

LO 3.13 Perception and perceptual constancies



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Shape constancy

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Gestalt Principles

- Figure–ground - the tendency to perceive objects, or figures, as existing on a background.
- Reversible figures - visual illusions in which the figure and ground can be reversed.

Menu

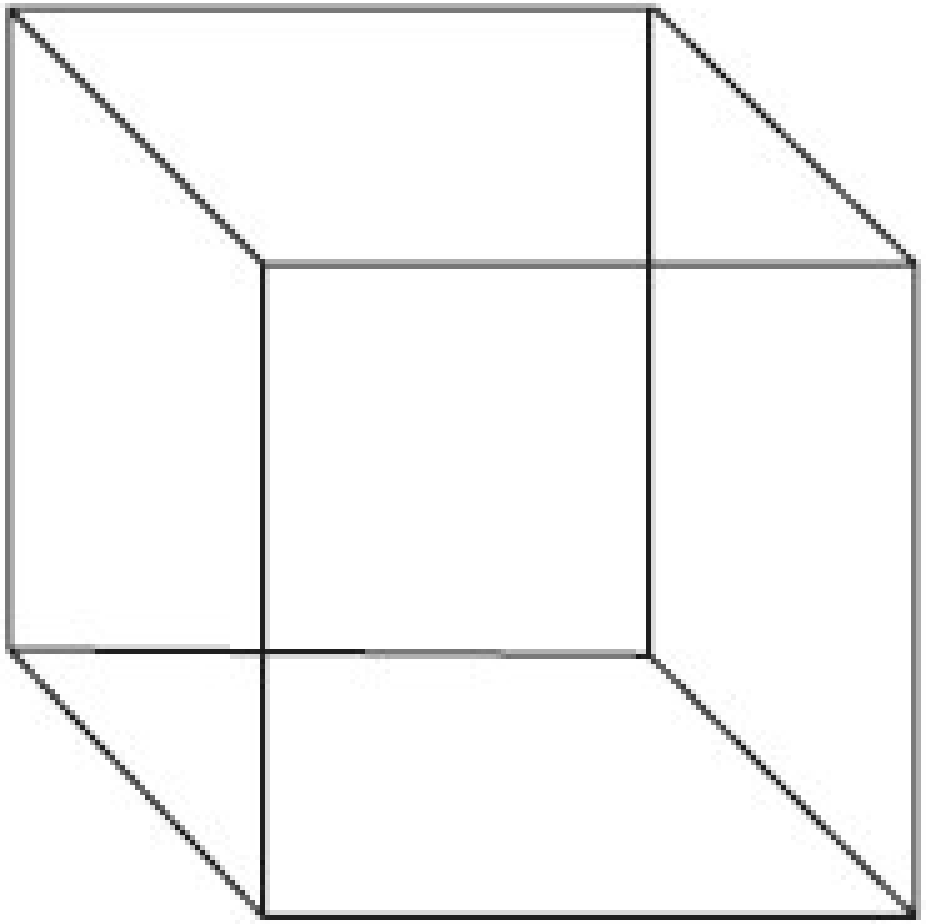
FIGURE 3.16 **Figure-Ground Illusion**
What do you see when you look at this picture? Is it a wine goblet? Or two faces looking at each other? This is an example in which the figure and the ground seem to "switch" each time you look at the picture.

LO 3.14 Gestalt principles of perception

Menu

FIGURE 3.15 **The Necker Cube**
This is an example of a reversible figure. It can also be described as an ambiguous figure, since it is not clear which pattern should predominate.

LO 3.14 Gestalt principles of perception



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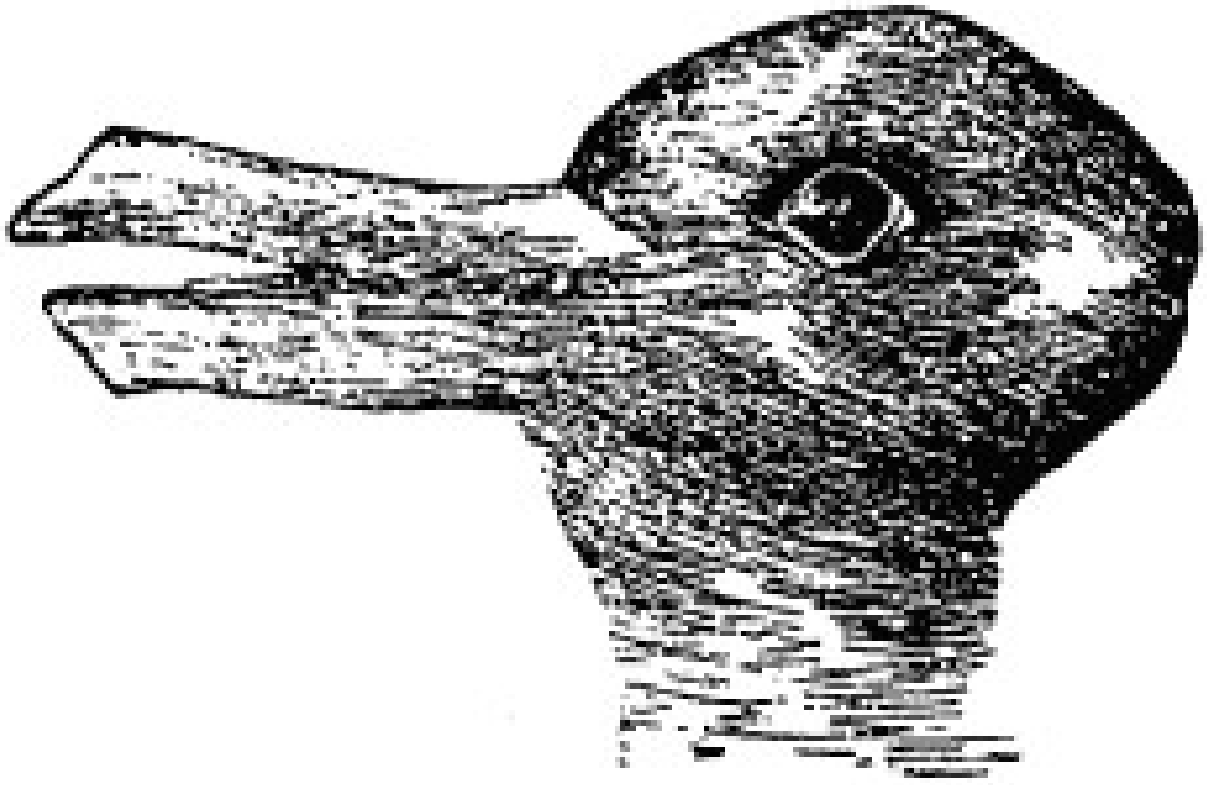
Do you see an old lady or a young lady?

Menu

Do you see a rabbit or a duck?



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The white and black stripes on these zebras can be reversed – both can serve as either figure or ground.

LO 3.14 Gestalt principles of perception

Menu

Gestalt Principles

- Similarity - the tendency to perceive things that look similar to each other as being part of the same group.
- Proximity - the tendency to perceive objects that are close to each other as part of the same grouping.
- Closure - the tendency to complete figures that are incomplete.
- Continuity - the tendency to perceive things as simply as possible with a continuous pattern rather than with a complex, broken-up pattern.
- Contiguity - the tendency to perceive two things that happen close together in time as being related.

Menu

FIGURE 3.17 **Gestalt Principles of Grouping** The Gestalt principles of grouping are shown here. These are the human tendency to organize isolated stimuli into groups on the basis of five characteristics: proximity, similarity, closure, continuity, and common region.

Proximity: The dots on the left can be seen as horizontal or vertical rows—neither organization dominates. But just by changing the proximity of certain dots, as in the other two examples, we experience the dots as vertical columns (middle) or horizontal rows (right).

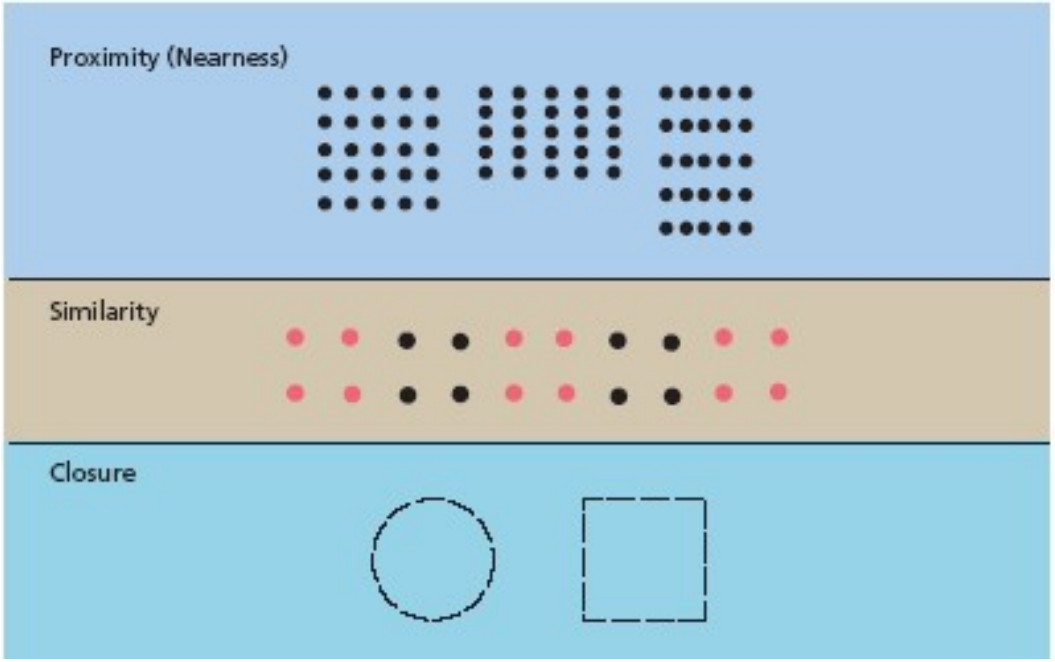
Similarity: The similarity of color here makes you perceive these dots as forming black squares and color squares rather than two rows of black and colored dots.

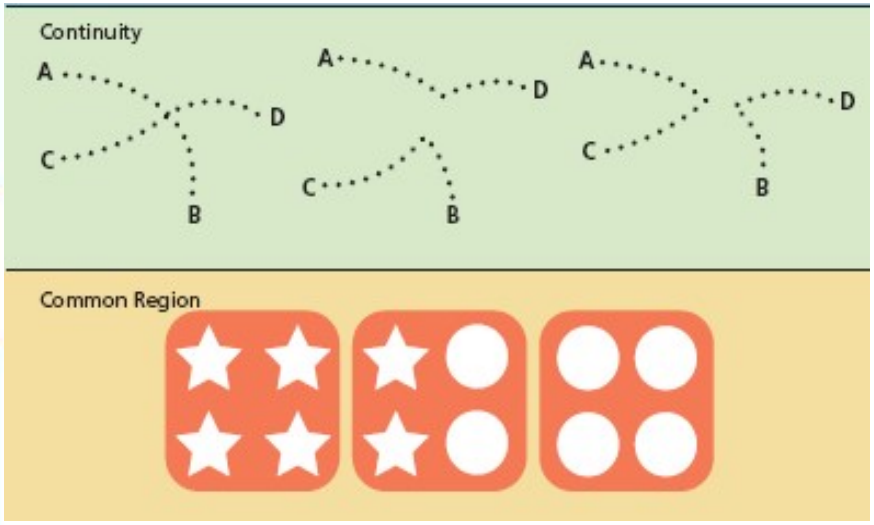
Closure: Even though the lines are broken, we still see these figures as a circle and a square—an example of how we tend to "close" or "fill in" missing parts from what we know of the whole.

Continuity: Because of continuity, we are much more likely to see the figure on the left as being made up of two lines, A to B and C to D, than we are to see it as a figure made up of lines A to D and C to B or A to C and B to D.

Common Region: Similarity would suggest that people see two groups, stars and circles. But the colored backgrounds define a visible common region, and the tendency is to perceive three different groups.

LO 3.14 Gestalt principles of perception





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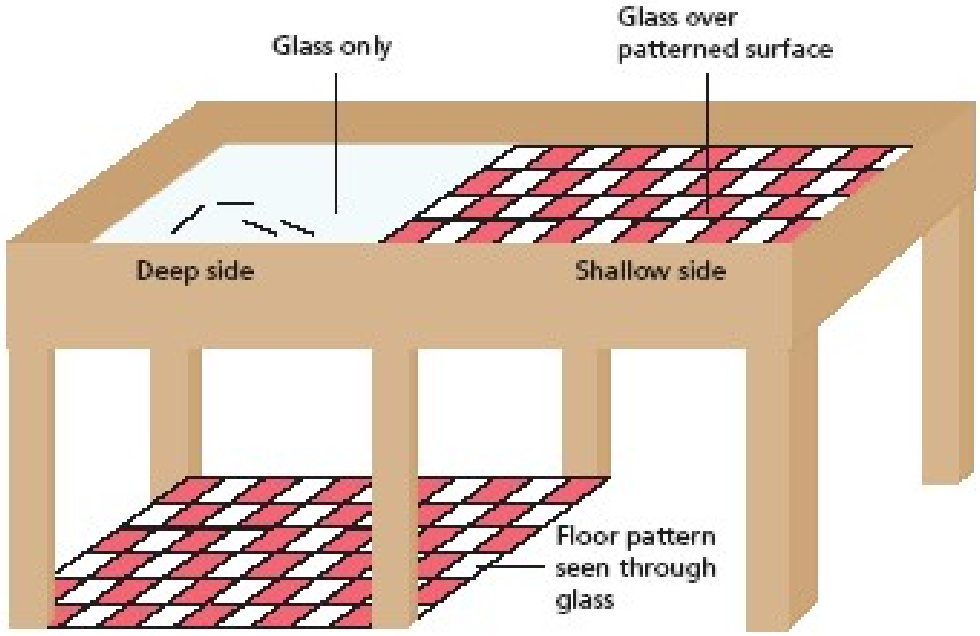
Depth Perception

- Depth perception - the ability to perceive the world in three dimensions.
- Studies of depth perception
  - Visual cliff experiment

Menu

FIGURE 3.18 **The Visual Cliff Experiment** In the visual cliff experiment, the table has both a shallow and a "deep" side, with glass covering the entire table. When an infant looks down at the deep-appearing side, the squares in the design on the floor look smaller than the ones on the shallow side, forming a visual cue for depth. Notice that this little girl seems to be very reluctant to cross over the deep-appearing side of the table, gesturing to be picked up instead.



LO 3.15 Perceiving the world in three dimensions

Menu

Monocular Cues

- Monocular cues (pictorial depth cues) – cues for perceiving depth based on one eye only.
  1. Linear perspective – the tendency for parallel lines to appear to converge on each other.
  2. Relative size - perception that occurs when objects that a person expects to be of a certain size appear to be small and are, therefore, assumed to be much farther away.
  3. Interposition (overlap) - the assumption that an object that appears to be blocking part of another object is in front of the second object and closer to the viewer.

Menu

Monocular Cues

4. Aerial perspective - the haziness that surrounds objects that are farther away from the viewer, causing the distance to be perceived as greater.
5. Texture gradient - the tendency for textured surfaces to appear to become smaller and finer as distance from the viewer increases.
6. Motion parallax - the perception of motion of objects in which close objects appear to move more quickly than objects that are farther away.
7. Accommodation - as a monocular clue, the brain's use of information about the changing thickness of the lens of the eye in response to looking at objects that are close or far away.

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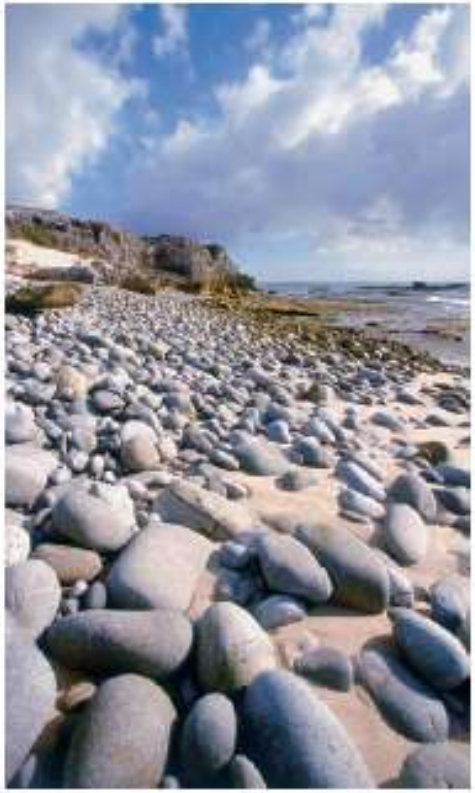
LO 3.15 Perceiving the world in three dimensions

FIGURE 3.19 **Examples of Pictorial Depth Cues** (a) Both the lines of the trees and the sides of the road appear to come together in the distance. This is an example of linear perspective. (b) Notice how the larger pebbles in the foreground seem to give way to smaller and smaller pebbles near the middle of the picture. Texture gradient causes the viewer to assume that as the texture of the pebbles gets finer, the pebbles are getting farther away. (c) In aerial perspective, the farther away something is the hazier it appears because of fine particles in the air between the viewer and the object. Notice that the road and farmhouse in the foreground are in sharp focus while the mountain ranges are hazy and indistinct. (d) The depth clue of relative size appears in this photograph. Notice that the flowers in the distance appear much smaller than those in the foreground. Relative size causes smaller objects to be perceived as farther away from the viewer.

a.

c.

b.



d.

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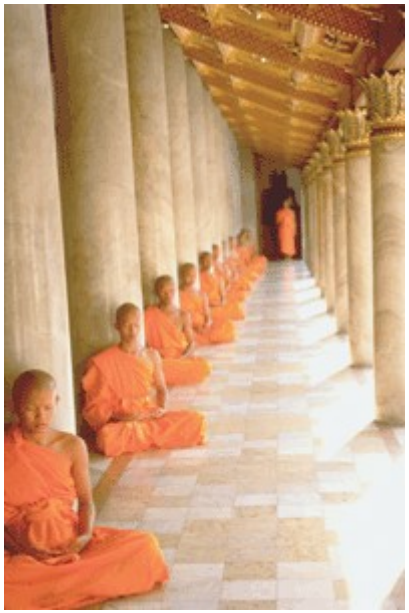
LO 3.15 Perceiving the world in three dimensions

Pictorial depth cues



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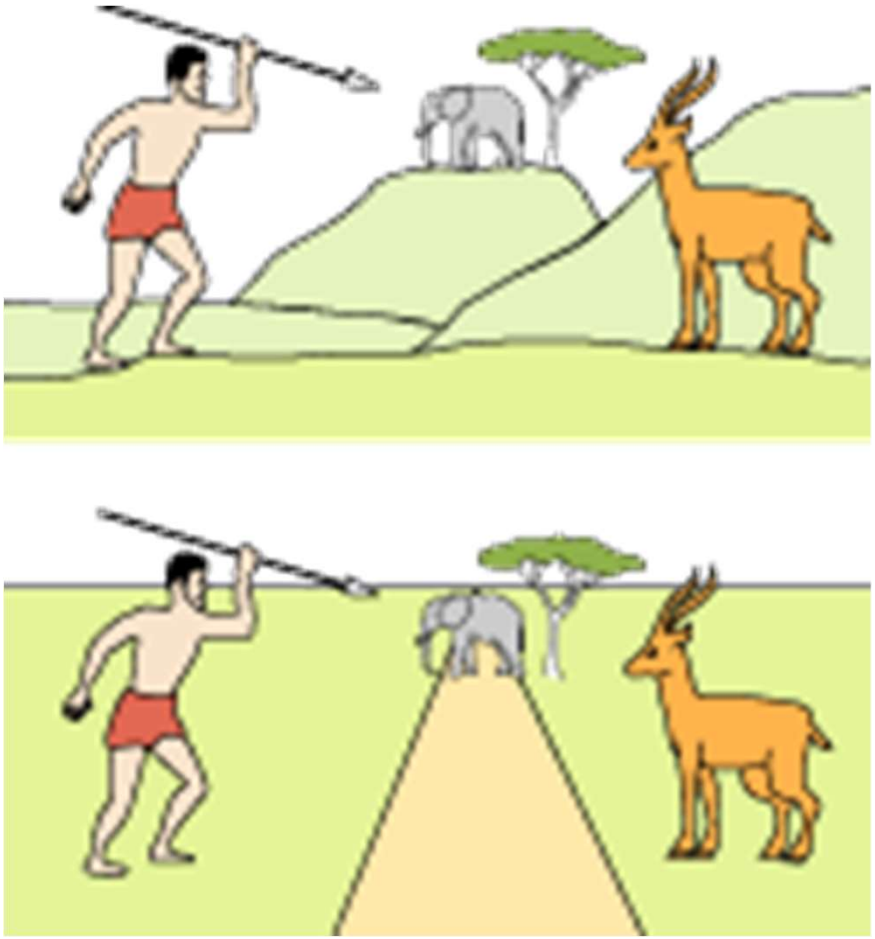
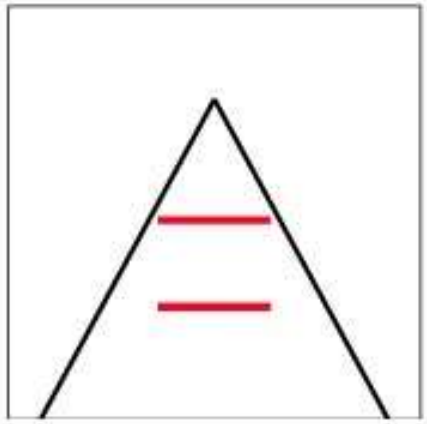
LO 3.15 Perceiving the world in three dimensions

Linear Perspective





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Binocular Cues

- Binocular cues - cues for perceiving depth based on both eyes.
  1. Convergence - the rotation of the two eyes in their sockets to focus on a single object, resulting in greater convergence for closer objects and lesser convergence if objects are distant.
  2. Binocular disparity - the difference in images between the two eyes, which is greater for objects that are close and smaller for distant objects.

Menu

Perceptual Illusions

- Müller-Lyer illusion - illusion of line length that is distorted by inward-turning or outward-turning corners on the ends of the lines, causing lines of equal length to appear to be different.
- Moon illusion – the moon on the horizon appears to be larger than the moon in the sky.
  - Apparent distance hypothesis
- Illusions of Motion:
  - autokinetic effect - a small, stationary light in a darkened room will appear to move or drift because there are no surrounding cues to indicate that the light is *not* moving.
  - stroboscopic motion - seen in motion pictures, in which a rapid series of still pictures will appear to be in motion.
  - phi phenomenon – lights turned on in a sequence appear to move.

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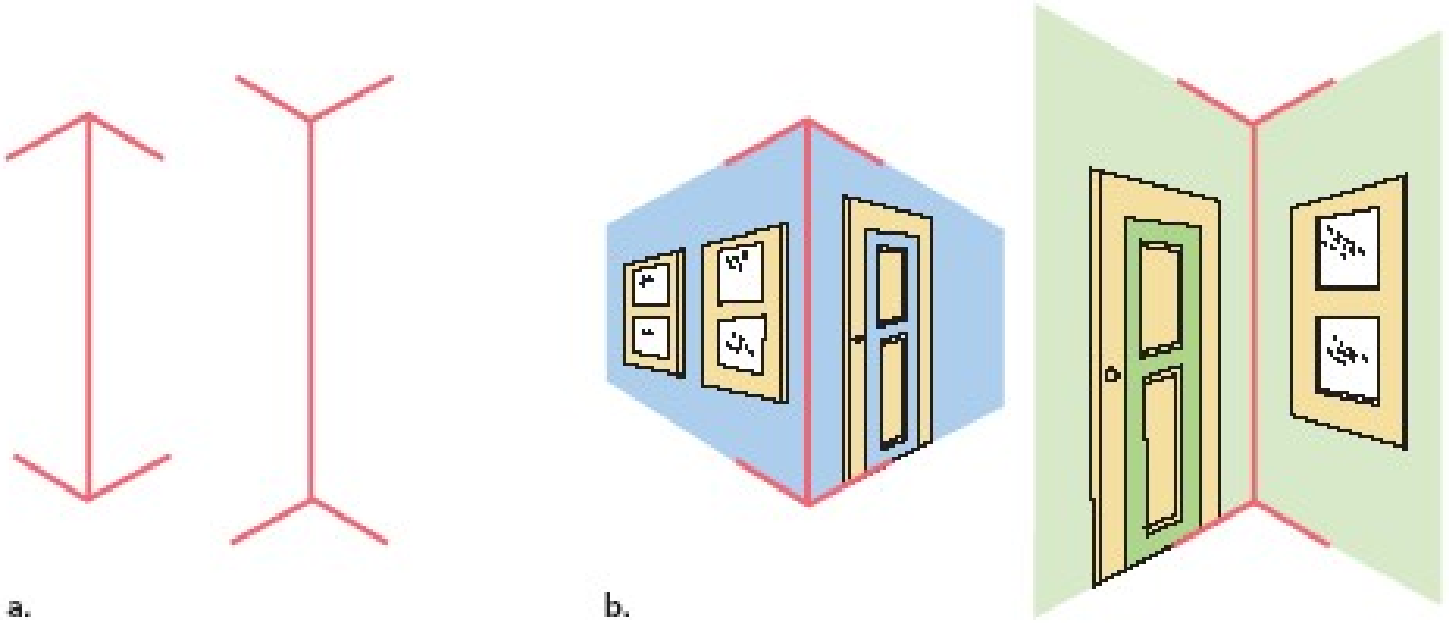
LO 3.16 Visual illusions

FIGURE 3.20 **The Müller-Lyer Illusion** (a) Which line is longer? In industrialized Western countries, people generally see the lines in part (a) in situations such as in part (b). According to one theory, they have become so accustomed to seeing right angles in their environment and assume that the short, slanted lines are forming a right angle to the vertical line. They make that assumption because they are accustomed to seeing corners, such as the ones shown in the figure on the right. Consequently, in the figure on the left, they tend to perceive the line on the right as slightly longer than the line on the left.



a. b.

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LO 3.16 Visual illusions

The moon illusion. When this moon is high in the night sky it will still be the same size to the eye as it is now. Nevertheless, it is perceived to be much larger when on the horizon. In the sky, there are no objects for comparison, but on the horizon, objects such as this tree are seen as being in front of a very large moon.

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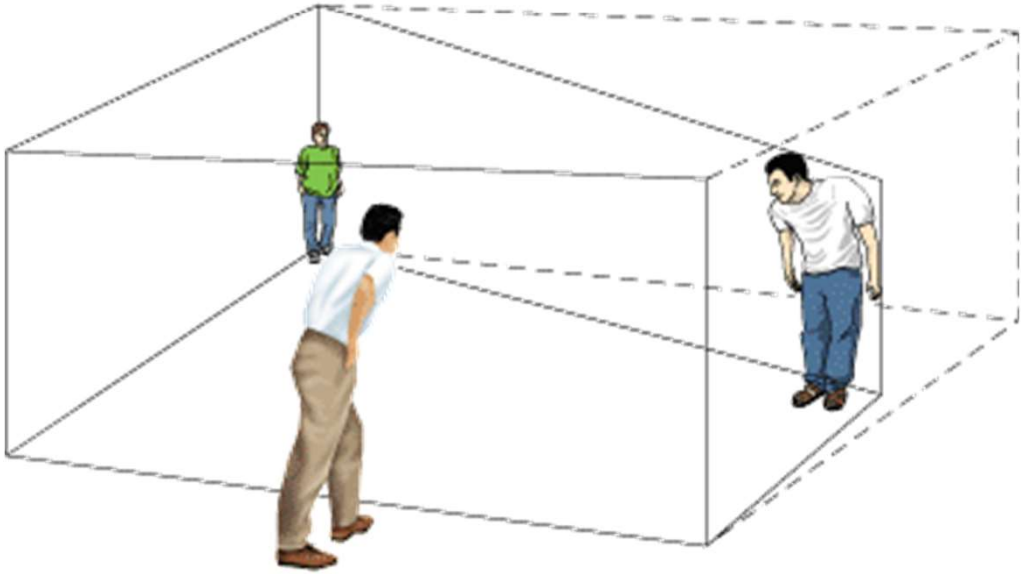
Ame's room illusion



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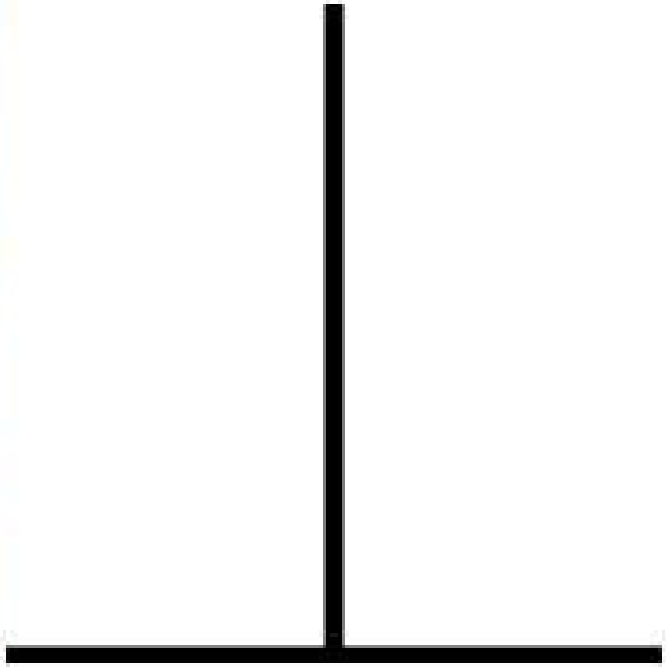
LO 3.16 Visual illusions



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Factors that Influence Perception

- Perceptual set (perceptual expectancy) - the tendency to perceive things a certain way because previous experiences or expectations influence those perceptions.
- Top-down processing - the use of preexisting knowledge to organize individual features into a unified whole.
- Bottom-up processing - the analysis of the smaller features to build up to a complete perception.

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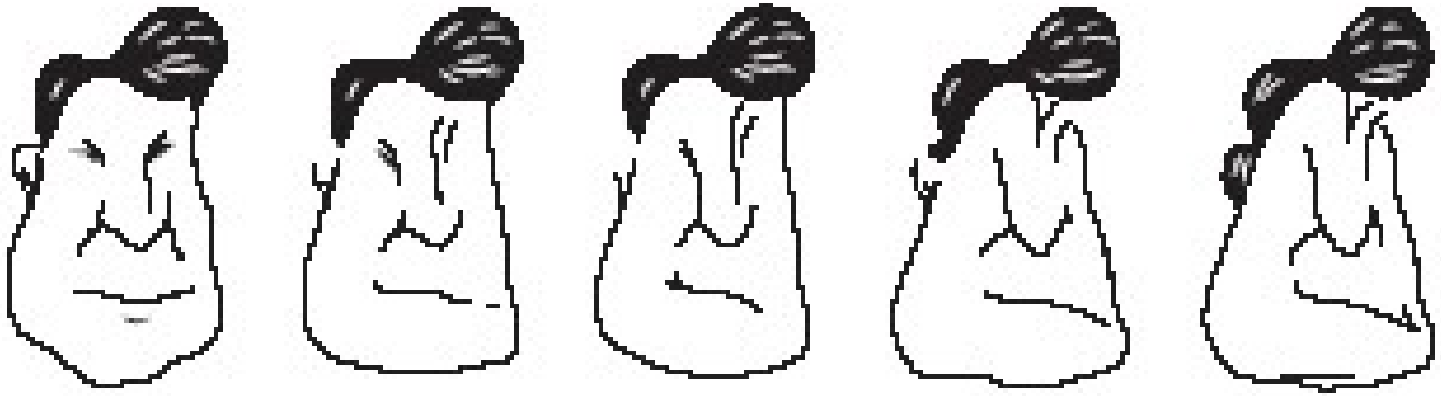
LO 3.17 Factors that influence perception

FIGURE 3.21 **Perceptual Set** Look at the drawing in the middle. What do you see? Now look at the drawings on each end. Would you have interpreted the middle drawing differently if you had looked at the drawing of the man or the kneeling woman first?



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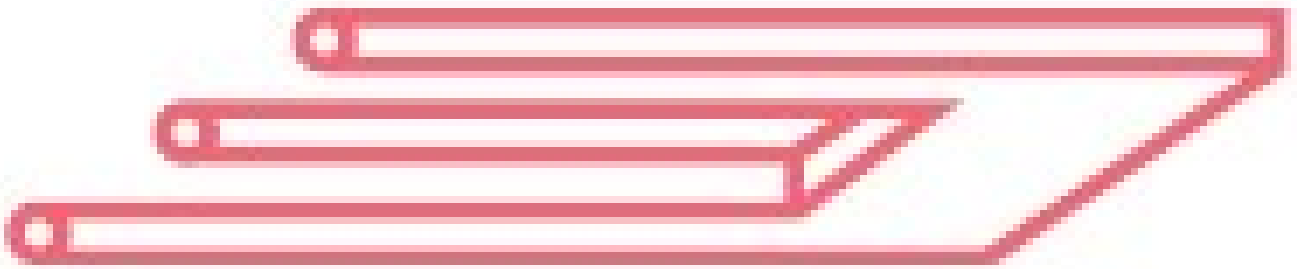
LO 3.17 Factors that influence perception

FIGURE 3.22 **The Devil's Trident** At first glance, this seems to be an ordinary three-pronged figure. But a closer look reveals that the three prongs cannot be real as drawn. Follow the lines of the top prong to see what goes wrong.



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Applying Psychology

- Extrasensory Perception (ESP) - claim of perception that occurs without the use of normal sensory channels such as sight, hearing, touch, taste, or smell.
  - Telepathy - claimed ability to read another person's thoughts, or mind reading.
  - Clairvoyance - supposed ability to "see" things that are not actually present.
  - Precognition - supposed ability to know something in advance of its occurrence or to predict a future event.
- Parapsychology - the study of ESP, ghosts, and other subjects that do not normally fall into the realm of ordinary psychology.

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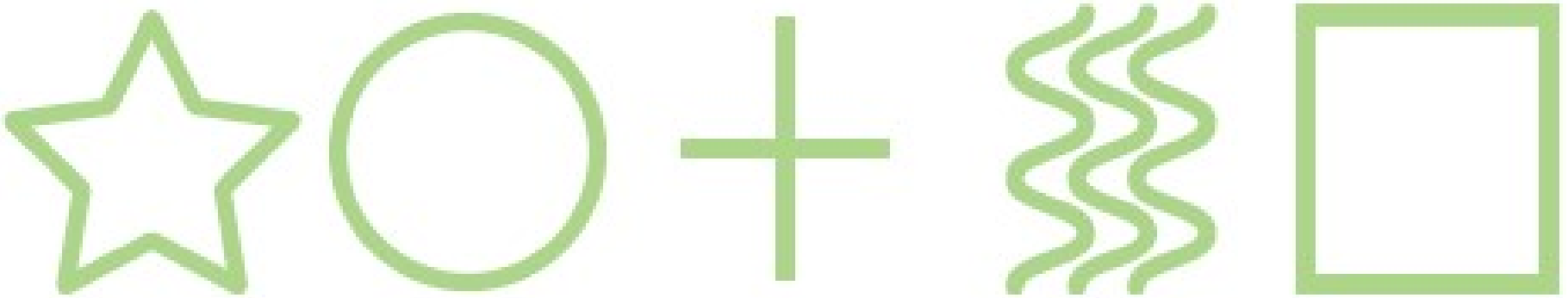
FIGURE 3.23 **Zener Cards** These five shapes, star, circle, cross, wavy lines, and square are used in a test for telepathy, a form of extrasensory perception. One person (the sender) looks at each card after pulling it from a randomly shuffled deck of these five cards and thinks about the image on the card. The person being tested for telepathy, who cannot see the card, is supposed to guess what the shape is. An accuracy rate greater than chance is taken as an indication of telepathic ability.

LO 3.17 Factors that influence perception



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